OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

JULY 24, 1950
VOLUME 39, NO. 15

AMERICAN DYESTUFF REPORTER

DEVOTED TO TEXTILE CHEMISTRY • BLEACHING • DYEING • PRINTING • FINISHING

Something NEW *Something* BETTER

In the short time that Polar Grey BL* has been available a number of woolen mills have hailed it as superior to older greys formerly considered indispensable or unequaled.

Solubility, neutral dyeing ability, good fastness to light, better resistance to fulling, decatizing, carbonizing, and retention of shade under artificial light, complement other fastnesses and an extremely desirable shade to justify changing to

POLAR GREY BL

As a print color on wool or silk, Polar Grey BL, because of its solubility and good all around fastness properties, is most interesting. Filament and Spun Nylon, too, find Polar Grey BL desirable for shade and excellent wash and light fastness.

A booklet is on the press — write for it and for a sample.

* *Patent Applied For*

Geigy

Dyestuff Makers Since 1859

GEIGY COMPANY, Inc.

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BRANCH OFFICES: Boston • Charlotte, N. C. • Chicago • Los Angeles • Philadelphia
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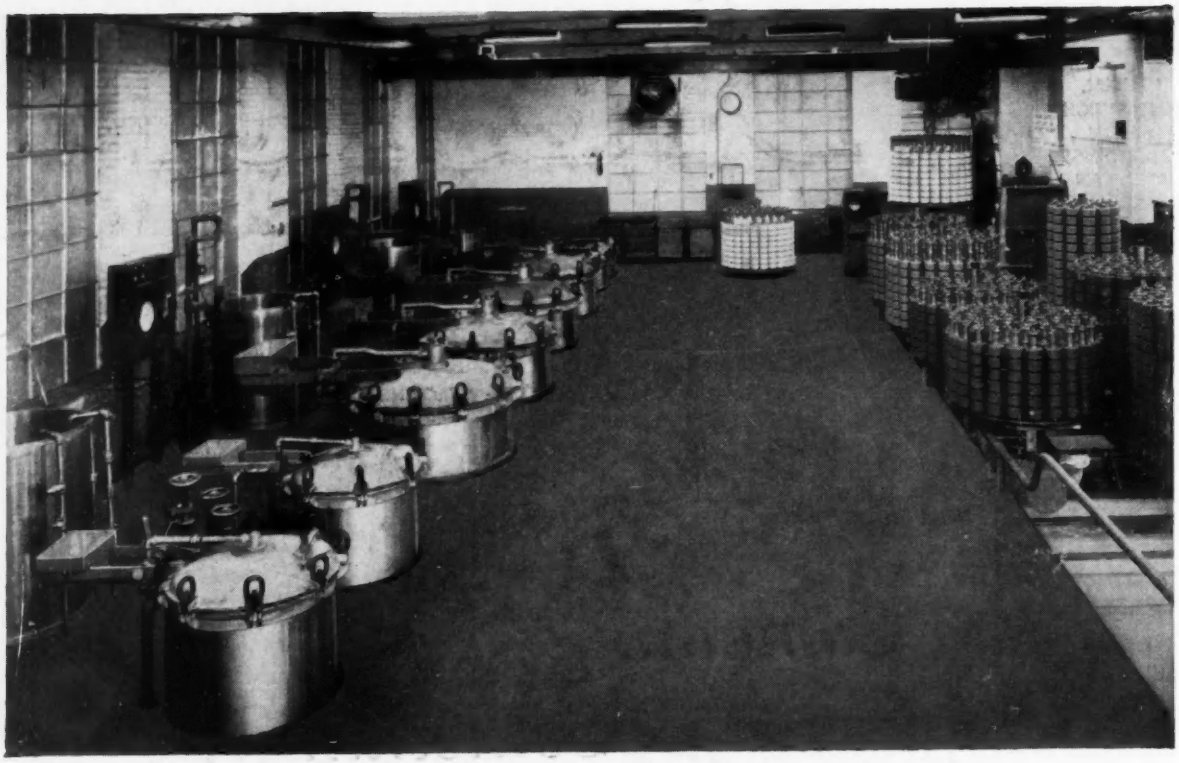
IN GREAT BRITAIN: The Geigy Co., Ltd., National Buildings, Parsonage, Manchester



Installation of Gaston County "automatically controlled" Package Dyeing Machines, Extractor, and Dryers.

FULLY AUTOMATIC MACHINES ASSURE PRE-DETERMINED DYEING RESULTS

Gaston County features that save time and money; eliminate costly guesswork and waste . . .

POSITIVE CONTROL . . . From the loading to the unloading of the kiers, every phase of the dyeing operation is under positive control. Less skilled help is required because all machines are equipped with automatic temperature controls, automatic dye liquor flow reversing mechanisms, patented two-way running wash system, and dye liquor flow controls.

ACCURACY IN MATCHING COLORS . . . Robot DYEMASTER controls provide permanent records for matching colors quickly and perfectly.

FLEXIBILITY . . . Machines designed for package dyeing only can be furnished for 1⅝", ⅝" perforated tubes, spiral springs, wool tops, Barber-Coleman cheeses, or any other size perforated tube.

ALL MACHINES AVAILABLE IN STAINLESS STEEL OR NICKEL IRON . . . Extremely compact in design, machines are available in single or multiple kier set-ups, ranging from 1 to 2000 pounds. We also build Combination Beam and Package Dyeing machines.

WRITE FOR COMPLETE INFORMATION

GASTON COUNTY DYEING MACHINE CO.

PIONEERS IN AUTOMATICALLY CONTROLLED DYEING MACHINES

STANLEY, N. C.

Albert R. Breen
80 East Jackson Blvd.
Chicago, Ill.

Gaston County Dyeing Machine Co.
Terminal Building, 68 Hudson St.
Hoboken, N. J., G. Lindner, Mgr.

The Rudel Machine Co., Ltd.
614 St. James St., W., Montreal
137 Wellington St., W., Toronto

American Dyestuff Reporter, Vol. 39, No. 15, July 24, 1950. Published every other Monday. Copyright 1950, by Howes Publishing Co., Inc., 44 E. 23rd St., New York 10, N. Y. Domestic subscription, $5.00; Canadian, $6.00. Foreign, $10.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

FROM CIBA RESEARCH...

Timely Data on Dyeing

NYLON

properties of the

YOUR INQUIRY IS INVITED on any and all problems arising from the dyeing of Nylon.

Here at Ciba, we realize that because of its wonderful physical properties the use of Nylon alone or as a blend component is constantly increasing . . . and the dyer's problems in direct proportion.
The dyeing of blends, especially those of Nylon and Wool, may be extremely baffling, and all of these factors play a part in the best color selection...

1. The end use requirements
2. The percentage composition of each fiber
3. The pigmentation in the Nylon
4. The depth of shade to be dyed.

Obviously there can be no such thing as a standard formula applicable to all constructions. Each shade on each blend becomes an individual problem. From exhaustive tests and a compilation of data, we believe we can give you helpful practical advice for your particular fiber or fabric and we invite you to tell us your problem.

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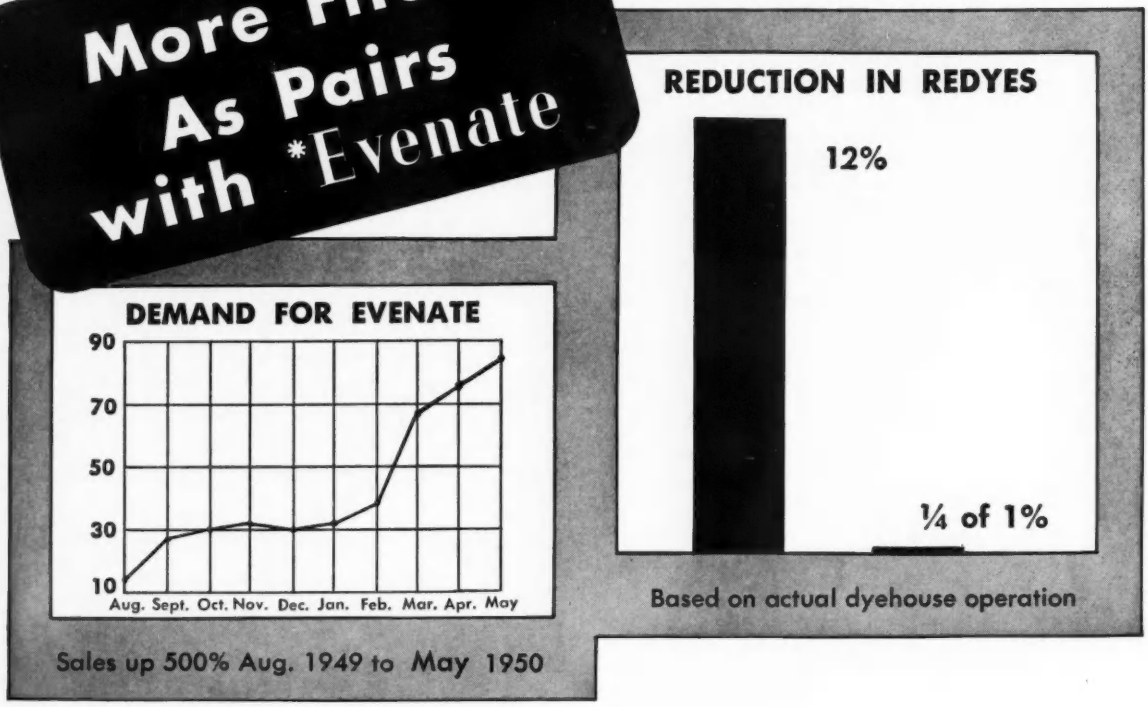
More Firsts As Pairs with *Evenate

*Evenate is a thin paste readily soluble in the dyebath. It is a non-ionic condensate combined with a glyceride.



Let us show you the difference in hosiery treated with Evenate in the dyebath — the faster pairing that can be done . . . the fewer variations in shades that occur . . . how accurately different dye lots can be matched.

Check these results obtained on Nylon hosiery with this amazing new dyeing assistant:

(1) Redyes reduced from 12% to ¼ of 1% — the customers' figures, not ours.
(2) Better control of dyebath.
(3) Better unions between leg and welt.
(4) Better penetration.

Evenate make redyeing operations more economical. Even in mixed dye lots, Evenate reduces shade levelly, holds unions to shade without stripping.

Try Evenate in your production. Works equally well with acid colors and acetate dyes. Write for full details.

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AMANTHRENE* VAT COLORS
provide the answer to the demand for
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FLAVONE GC

in paste or double powder form

Our newest vat color particularly recommended for **printing** fine cottons and rayons. Easily adapted to **dyeing** of these same fibers. Unequaled for all around fastness to washing, chlorine or peroxide bleaching and soda boiling. Gives a perfect Kelly Green when used in combination with AMANTHRENE BRILLIANT GREEN J. Offers the particular advantage of a fine, smooth paste.

Another of the Amanthrene range of superior vat colors. For detailed information on the whole range available, as well as data regarding your own particular requirements, consult our nearest branch. A.A.P. technicians are always happy to be of service.

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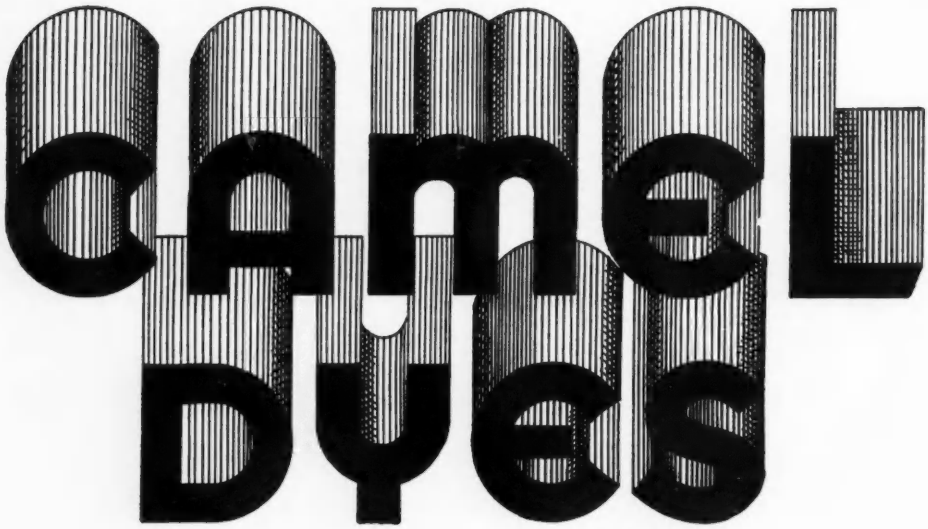

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B&A Purified Ammonium Sulfate differs distinctly from ordinary commercial ammonium sulfate. It is not a by-product material. Rather, it is produced by B&A as a basic fine chemical using pure raw materials. It assays 99% min. $(NH_4)_2SO_4$ and is low in iron, lead, and arsenic, thus providing a quality for the most exacting uses.

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A New Anti-Static and Fibre Lubricant for Nylon

Static in nylon piece goods and on nylon yarns is common and costly . . . it attracts lint and dust, troubles workers with annoying shocks, causes goods to cling to machinery, boxes and tables, which slows cutting, sewing and inspection and affects the drape of the finished garment.

STOP STATIC IN NYLON...
add softness to nylon

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As specialists in the manufacture of Toluene derivatives Hooker offers eleven products or intermediates giving you a wide choice from one source.

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Hooker's long experience with the development of chlorine derivatives has built a fund of technical knowledge that is available to you in determining the intermediate best suited to your requirements. End product desired, equipment, yield, cost, handling, etc., should be discussed with our technical staff.

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The famous Hooker "S" Cell provides a continuous supply of high purity Chlorine. This, plus carefully selected raw materials and the special processing techniques developed over the years, makes Hooker intermediates the highest quality obtainable. This permits substantial savings in manufacturing by eliminating fluctuations due to quality variations.

Data sheets on Hooker Toluene derivatives are available when requested on your company letterhead. Bulletin 320 gives more details on the reactions of these products.

BENZYL CHLORIDE

Synonym ..... Alphachlorotoluene
Formula ..... $C_6H_5CH_2Cl$
Molecular Weight 126.5
Freezing Point ..... −43°C
Distillation Range ..... 5° or less including 179.4°C
Refractive Index, n25/D 1.5365
Specific Gravity, 15.5°/15.5°C 1.107

DESCRIPTION

Colorless to light yellow liquid having a pungent odor. The above data are for the high grade product. Also available as a technical grade with a wider distillation range.

USES

In manufacture of intermediates, dyestuffs, perfume bases, plasticizers, resins, wetting agents, rubber accelerators, gasoline gum inhibitors, pharmaceuticals.

BENZOIC ACID

Synonym ..... Phenylformic Acid
Formula ..... C_6H_5COOH
Molecular Wt. 122.1
Melting Point ..... 122.0°C
Solubility, gms/100 gms
Water at 18°C 0.27
Alcohol at 15°C 32
Ether at 15°C 40

DESCRIPTION

White, odorless, crystalline solid, sold in powdered form. U.S.P. grade meets requirements of U.S. Pharmacopeia XIV. Technical grade does not quite meet these requirements.

USES

Dyestuff intermediate, manufacture of perfumes and pharmaceuticals, manufacture of benzoates; preservative for textile sizing, foods, cosmetic creams, lotions, antiseptics, dentifrices, and other pharmaceuticals.

SODIUM BENZOATE

Synonym ..... Benzoate of Soda
Formula ..... C_6H_5COONa
Molecular Wt. 144.0
Solubility, gms/100 gms
Water at 25°C 62.5
Alcohol at 25°C 2.3

DESCRIPTION

Hooker Sodium Benzoate is a white, odorless, crystalline solid in flake or powdered form. Available in two grades, U.S.P. and Technical.

USES

Chemical intermediate; preservative for foods, and as an antiseptic in pharmaceutical and cosmetic preparations. Also recommended as a corrosion resistant additive for certain solutions.

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

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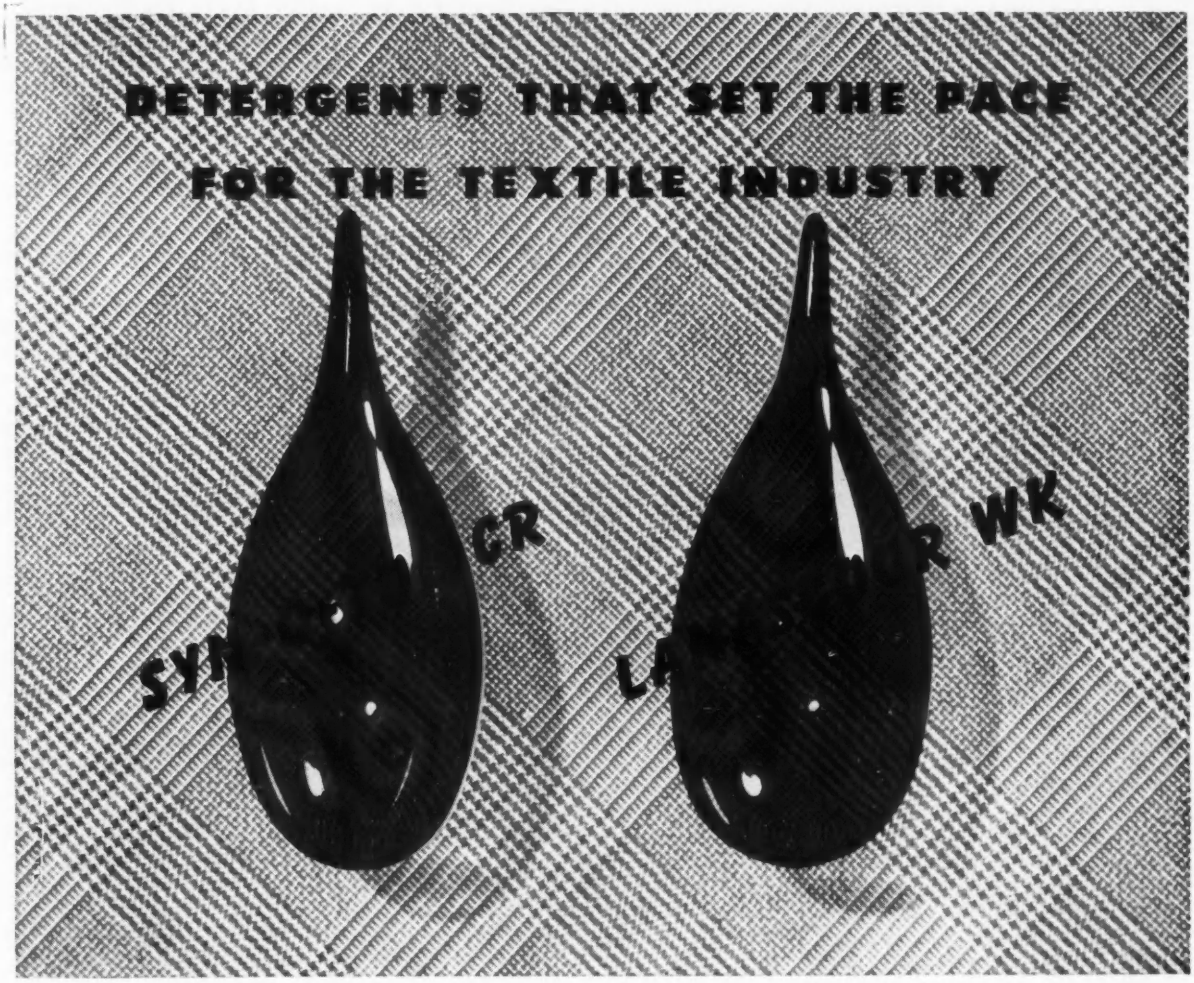
10-910

SODIUM SULFIDE • SODIUM SULFHYDRATE • SODIUM BENZOATE • CAUSTIC SODA • MURIATIC ACID • PARADICHLOROBENZENE • CHLORINE



SYN-O-TOL CR

Concentrated, Non-Sulfonated Detergent

SYN-O-TOL CR is a combination nonionic—anionic detergent, wetting agent and penetrant . . . contains less than 5% moisture!

SYN-O-TOL CR is a highly efficient detergent that provides a viscous "soapy" stock at about 20% concentration. It combines the advantages of high concentration with ease of handling.

SYN-O-TOL CR is highly effective in removing sizing material, oil, dirt, etc. . . . won't leave goods harsh and wiry . . . makes an ideal "soaping" agent for washing prints, provides synergistic action to detergent systems.

LANASCOUR WK

Synergistic Detergent for Wool Scouring

LANASCOUR WK combines high detergency action with superior penetrating power . . . produces resilient and lofty scoured wool.

LANASCOUR WK is economical and easy to use . . . scours gently and thoroughly in hard or soft water . . . holds dirt in suspension and won't form insoluble curds or scum.

In the scouring of wool, backwashing of tops, wetting of cotton-wool union fabrics in the fulling mill, processing blends of nylon or viscose staple and wool, LANASCOUR WK has no equal in effectiveness or economy!

For further information, send for technical data on LANASCOUR WK and SYN-O-TOL CR.

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Resin compositions for cotton, rayon, and wool

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Aqueous dispersion of rubber, reclaimed rubber, or resins

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Resin compositions for application to wool and cotton. Makes fabrics stronger, more durable and wools truly washable. Application is simple—requires no special drying conditions—no special equipment.

KANDAR adds beauty
A durable resin finish for cotton, rayon and blends. Its lasting crispness adds a pleasing texture. A highly stable, odorless resin, it is easy and economical to apply. Write for free sample.

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Other Products of Naugatuck Chemical are:
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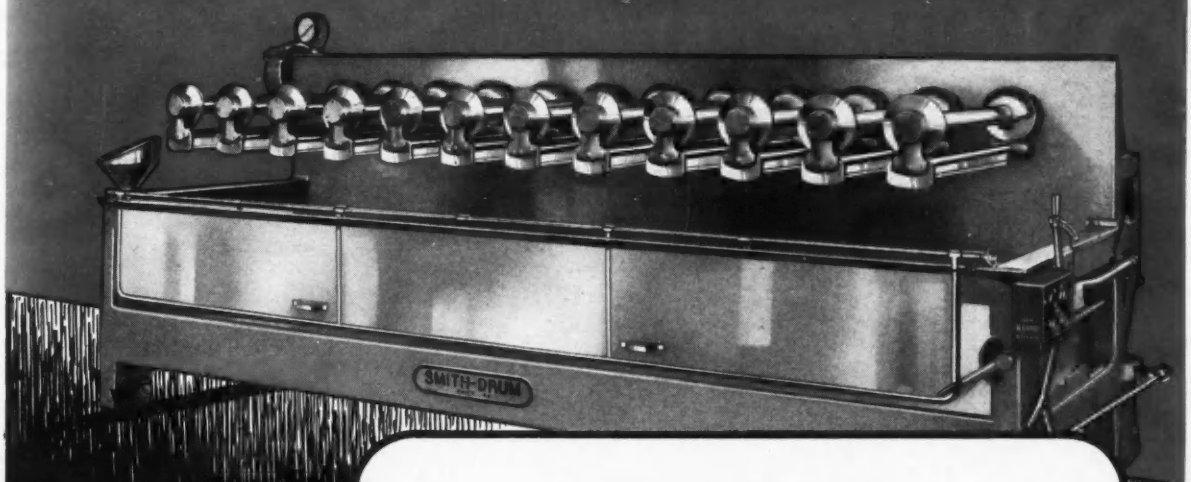
AGRICULTURAL CHEMICALS • SYNTHETIC RUBBER

✓ Prevents Snarling of Yarn

✓ INCREASES PRODUCTION UP TO 50%



✓ REDUCES DYEING COSTS 10 to 30%

SMITH-DRUM SKEIN DYEING MACHINE

This is the machine that "moves the liquor instead of the yarn." As a result of this principle, first introduced by Smith, Drum & Company, there is no tangling of the skeins or breaking of the filaments. This means greatly improved back-winding with consequent saving in time and cost.

Because there are fewer knots in each skein, the fabrics made of Smith-Drum dyed yarn are of better quality. Savings in dyestuffs, steam, water and floor space result in a reduction in over-all dyeing costs that run as high as 10-30%. Even in large capacity machines, there is no tendency toward variation of shade due to variation of temperature because entire body of liquor moves from one end of machine to the other. Because it handles larger batches than any other machine occupying the same floor space . . . and because faster dyeing permits more batches per day . . . this machine increases production as much as 50% over other types of skein dyeing equipment. Catalog will be sent upon request.

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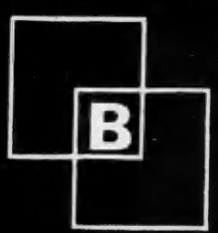

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IGEPONS

speed textile processing

IGEPONS
are used in every phase of textile wet processing:

Scouring
Wetting out
Degumming
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Dye levelling
Dye pasting
Chlorine and peroxide bleaching
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Lime soap inhibiting and dispersing
Finishing

IGEPONS are the ideal scouring, wetting-out, penetrating and level dyeing agents for all fibers and fabrics.

IGEPONS are stable in acid and alkaline solutions—have excellent detergent properties—rinse rapidly—disperse lime soap and are equally effective in hard or soft water at any temperature.

IGEPONS have high efficiency in low concentrations and save time and labor.

Our nearest office will be glad to furnish samples and technical information. Your inquiries will receive careful and prompt attention.

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IGEPALS — non-ionic detergents
NEKALS — wetting agents
SOROMINES — softening agents
BLANCOPHORS — optical brighteners
NULLAPONS — organic sequestering agents
COLLORESINES — thickening agents
EULANS — mothproofing agents
EMULPHORS — emulsifiers
PREVENTOLS — fungicides

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for wetting and dispersing purposes . . .

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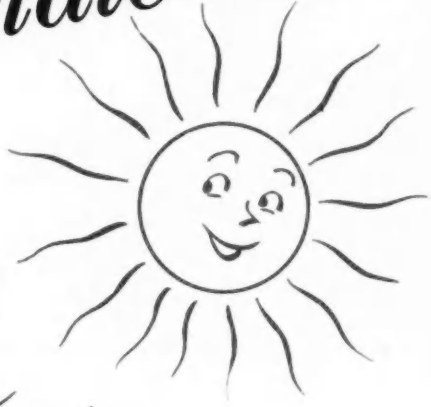
light-fast acetate RED

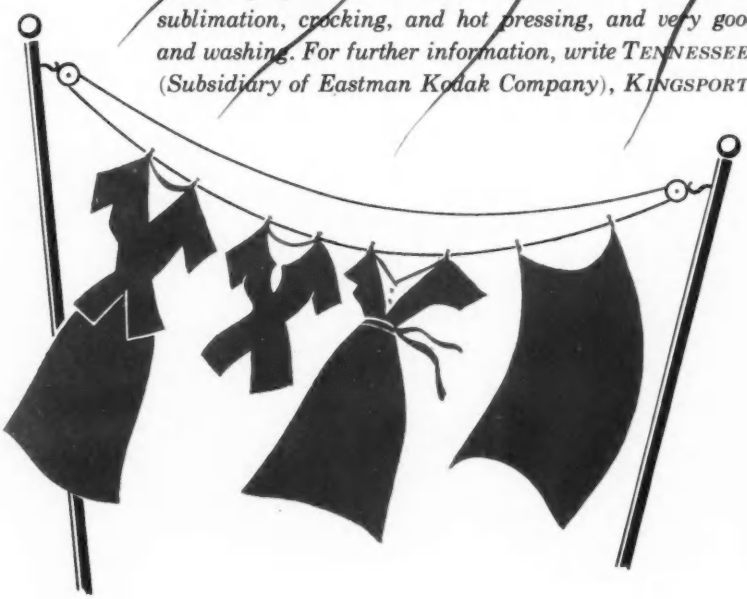


EASTONE RED GLF

** 30 to 40 hours light fastness*
** good penetration and build-up at 160° to 190° F*
** dischargeable as well as usable for plain dyeing*
** homogeneous and highly dispersed*
** good exhaustion and level-dyeing characteristics*

Eastone Red GLF, an acetate dye which produces a medium shade of red with a yellow cast, possesses exceptional light fastness, even in pastel shades. One of an entirely new family of dyes, Eastone Red GLF is unique among acetate reds with respect to fastness to light. It is recommended for any combination color where fastness-to-light is particularly desired.

Other properties of Eastone Red GLF include excellent resistance to gas fading, sublimation, crocking, and hot pressing, and very good fastness to perspiration and washing. For further information, write TENNESSEE EASTMAN CORPORATION *(Subsidiary of Eastman Kodak Company),* KINGSPORT, TENNESSEE.



Eastman
Acetate
Dyestuffs

Eastman Acetate Dyestuffs are sold in the United States through Tennessee Eastman Corporation in Kingsport, Tennessee, and Lodi, New Jersey; in Canada, through Clough Dyestuff Company Ltd., 33 St. Mathieu Street, St. Laurent, Quebec.

Lomar PW

NOW...
A Clear Road to Level Shades!

Jacques Wolf's Lomar PW is a dispersant used particularly for vat and acetate colors—not a wetting agent! Lomar PW causes finer dispersion of the dyestuff and prevents agglomerates. It gives greater assurance for level shades and resistance to wet crocking and rubbing. Insures "speck free" dyeings. Equally successful results regardless of dyeing method. Can be used advantageously with all colors from pastels to deep shades. Gives excellent penetration with subsequent advantages. Lomar PW has great dispersing properties and in consequence is used in minute quantities.

For complete information on Lomar PW, contact us today. Write for your copy of Bulletin No. 21.

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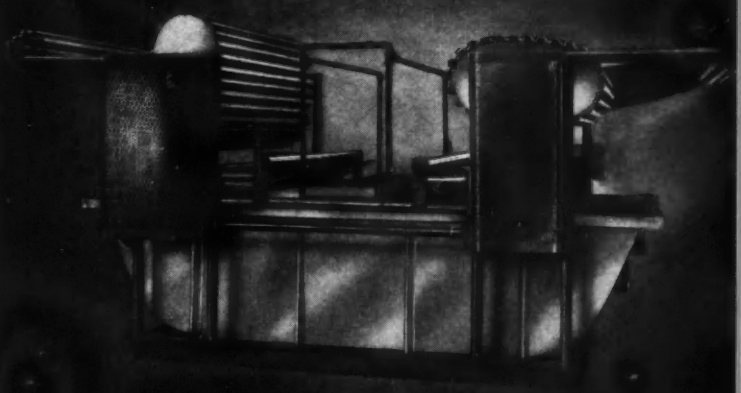

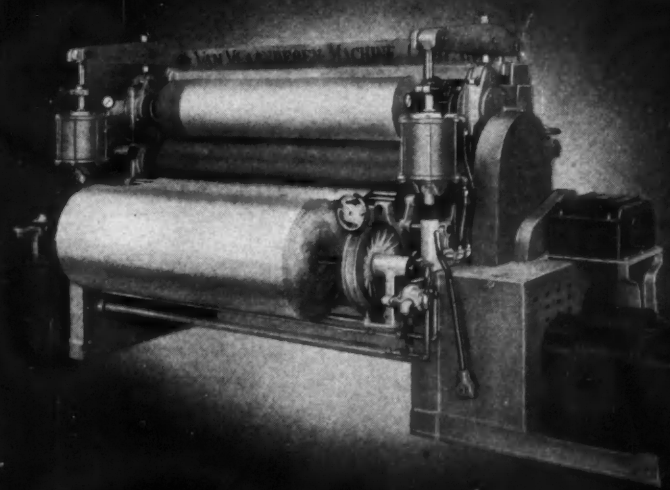

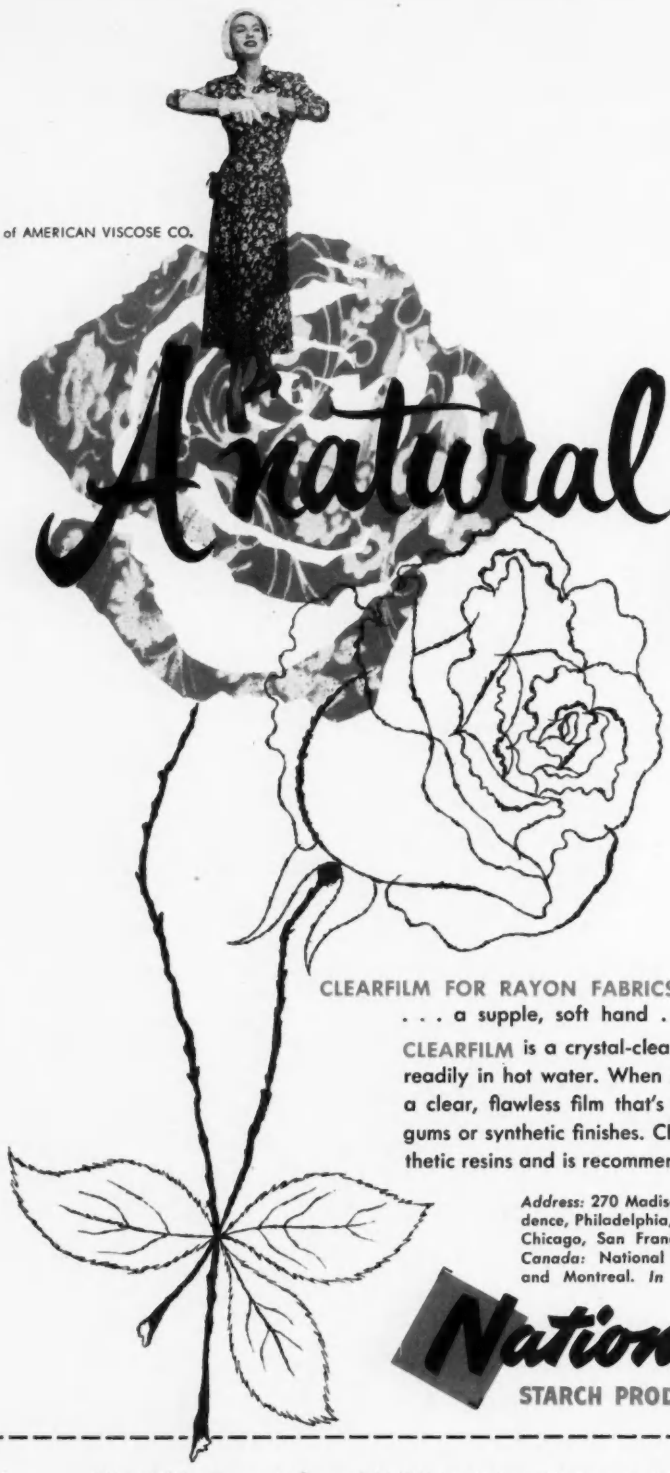

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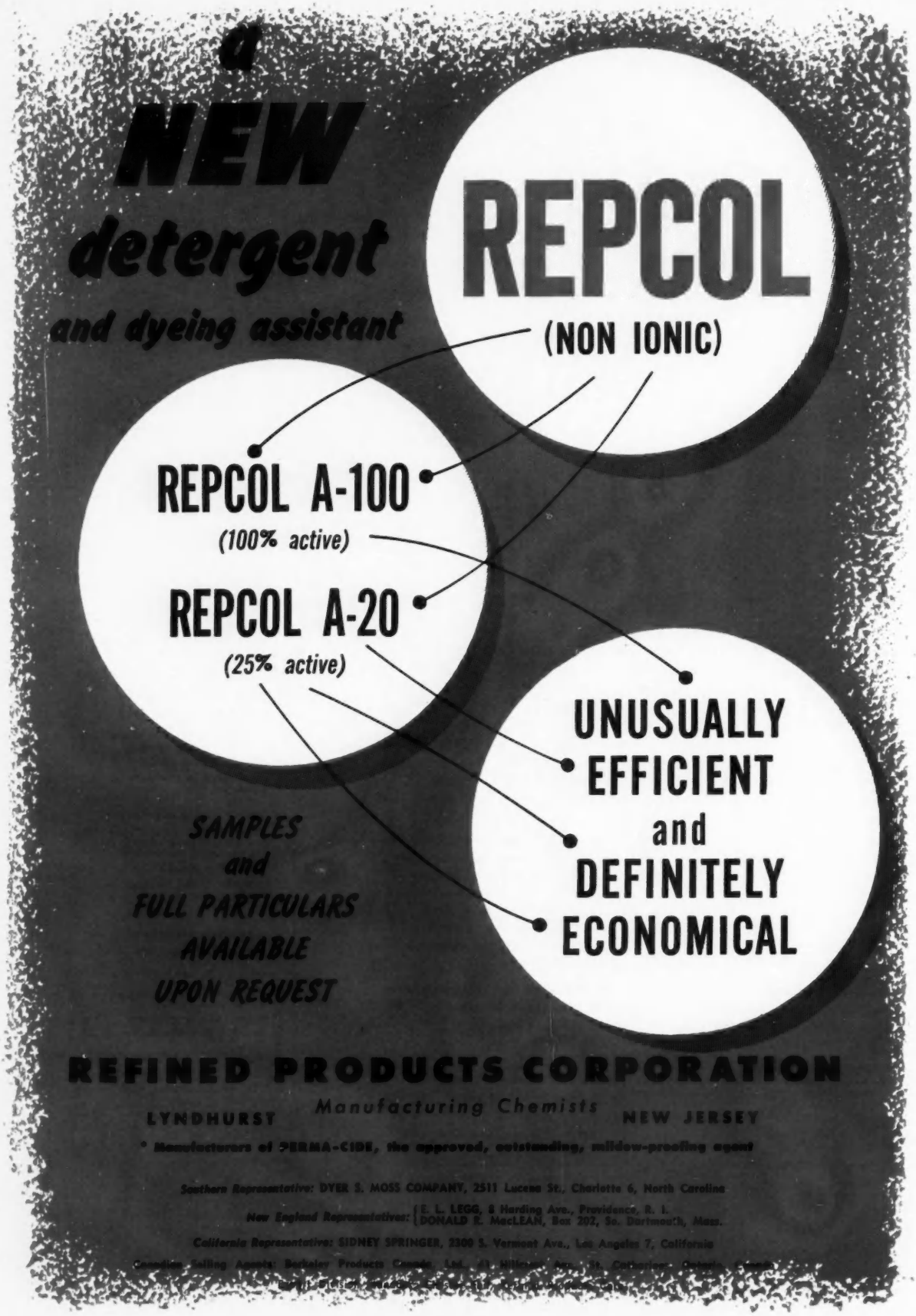
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JULY 24, 1950
VOLUME 39 NUMBER 15

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VOLUME 39 JULY 24, 1950 NUMBER 15

SOAP AND DETERGENTS AS AFFECTING TEXTILES*

FOSTER DEE SNELL
Foster D. Snell, Inc.

TEXTILE technologists have chosen to work in one of the most complex fields of interface chemistry, more commonly and less accurately designated as surface chemistry. Literally the fibers which make up the yarns, which make up the fabrics are all surface.

Aside from the natural cotton, wool, and silk which have three distinctly different types of surfaces, there is a whole parade of synthetics of varying ages: viscose rayon, acetate rayon, nylon, orlon, casein wool, zein wool, vinyl fibers, and so on. In each case the physical form of the fiber surface and the physical-chemical properties are both important. Both cotton and viscose rayon are cellulose but the physical form of the surface differs. Acetate rayon and nylon are both smooth fibers but with differing physical-chemical properties.

To confuse confusion, the weave itself in a textile also enters in, a loosely woven fabric is easier to deterge than a tightly woven one.

BASIC PRINCIPLES

When the molecules of a solid have a greater attraction for the molecules of a liquid than they have for each other, that solid will dissolve in the liquid. There is a perfectly precise method of specifying the difference in attraction in terms of the free energy change when the solid dissolves. Consider a solid immersed in a liquid. Molecules of the solid are constantly detaching themselves to go into solution, while other molecules are returning to the solid surface from solution. So there are two reverse processes taking place. When the concentration of dissolved solid is great enough so that molecules return to the solid as fast as they leave it, an equilibrium condition obtains, and the solution is said to be saturated.

Molecules of a surface-active agent always have a polar-nonpolar structure. One end is water soluble, the other end is insoluble. All of the familiar phenomena of surface activity are due to this schizophrenic quality of the surfactant molecules.

Molecules of this type will concentrate at water-oil interfaces, with the polar ends toward the water and the nonpolar ends toward the oil. Thus they aid emulsification, both by lowering interfacial tension, aiding the splitting up of oil droplets, and by forming protective coatings around the droplets, preventing coalescence. Such molecules also concentrate at water-air interfaces with the nonpolar ends toward the air. This lowers surface tension, aiding wetting and foaming. They concentrate at interfaces between solids and water. When the polar ends are oriented toward the water, this favors wetting. The solid is in effect covered by a carpet of polar groups which are easily wet. When the nonpolar ends orient outward, as happens for soaps on metal and for cationic agents on many fabrics, the situation is more complex. The film of sorbed molecules hinders wetting, but the lowered surface tension favors wetting. So as conceneration of agent increases from zero, wetting may change from good to poor to good again.

The polar-nonpolar structure of surfactants has an important consequence apart from tendency of molecules to concentrate at interfaces. In solution such molecules form clusters called micelles with the nonpolar chains facing inward and hence "dissolved" in each other, while the polar ends face outward and contact the water. This orientation results in lowest free energy. Most surfactants have fairly sharp critical micelle concentrations. Below those concentrations the agents exist almost entirely as free ions or molecules; above those concentrations they exist largely as clusters or micelles.

WETTING

To be an effective wetting agent, a surfactant must have strong affinity for the interface between water and the surface which is to be wet. It must also orient properly at that surface, with the polar group toward the water. Wetting may be measured in terms of Θ, the contact angle between the edge of the advancing liquid and the solid surface. If Θ is low, wetting is good. If Θ is high, especially if it is over 90°, wetting is poor. The solution will stand up in droplets on the solid surface instead of spreading over it.

More precisely wetting depends on "S", the surface tension of the liquid, as well as Θ. The geometry of the surface is also a factor. If the liquid must creep into capillary crevices in a porous or fibrous mass—the usual situation in textile wetting—the tendency for wetting to occur is measured by the function $W = S \cos \Theta$. If Θ is over 90°, W will be negative, which means that the solution will not penetrate the fabric. If Θ is under 90°, W is positive. Wetting will then occur, and the lower Θ, the more rapidly and thoroughly the fabric will be wet out. But S is also a factor. If Θ is under 90°, then wetting will be aided by a high value for surface tension. This is contrary to the usual belief. Wetting agents do not aid penetration of water into fabrics because they lower surface tension; they are effective because they reduce Θ. If they reduced Θ without lowering S, they would be even more effective. Further, if Θ is already low, the use of a wetting agent may actually hinder wetting, since Θ cannot be reduced much further but S will be reduced considerably. From time

* Presented before the June 7, 1950 meeting of the American Association of Textile Technologists at the Builders Club, New York.

to time this paradoxical effect is observed and occcasions much surprise.

Good wetting agents do not necessarily make good rewetting agents. For effective rewetting performance an agent must dry on the fibers with the polar ends of the surface layer of molecules oriented outwards. Some good wetting agents are not themselves easily wet by water when in the dry state because their surfaces are carpets of nonpolar groups.

TYPES OF SURFACE-ACTIVE AGENTS

Several hundred surfactants are now being offered for sale in the United States. This does not include brand-named mixtures of detergents and builders. There are three basic reasons for this multiplicity:

1. Many surfactants, each with specific virtues and shortcomings, can be synthesized. The three elements which make up the molecule, polar group, nonpolar group, and linking group, can all be varied in type and degree.

2. The most popular types of surfactants are marketed in almost identical form by many manufacturers under different names. An example is dodecyl benzene sulfonate, a popular member of the class of alkyl aryl sulfonates. Sometimes the same product may be marketed in solutions or powders of different concentrations.

3. To avoid patent infringement many detergents which are virtually equivalent in performance to other earlier types have been synthesized and marketed.

Here we are concerned only with the first reason. What are the salient advantages and disadvantages of the various surfactant types? Without drawing up ironclad rules, certain generalizations may be stated as a guide:

1. Proper balance between the polar and nonpolar sections of the molecules is important. Overbalance in either direction will prevent effective concentration and orientation at interfaces.

2. For optimum detergency a rather high ratio of nonpolar to polar section is required. A limit is reached when the ratio of the polar section of the molecule becames so great that the detergent is not sufficiently soluble in water.

3. For optimum wetting a somewhat lower ratio of nonpolar to polar section in the molecule is required.

4. Straight-chained molecules usually make the best detergents.

5. Molecules with branched chains and with polar groups in the center rather than at an end usually make the best wetting agents.

6. When use conditions are such as to promote hydrolysis, the stability of the surfactant must be considered. Ethers are more stable than esters in strongly acid or alkaline solutions.

7. Because of their strong sorption by the fibers, cationic agents are usually not good detergents for vegetable fibers such as cotton. At some concentrations they may act as antidetergents, promoting soil attachment. However, some are excellent detergents for wool.

8. Nonionic detergents can often be used at low concentrations because they are not sorbed to any great extent by the fibers. Anionic detergents such as sulfates and sulfonates are frequently sorbed to a considerable extent, and provision for this must be made in setting use concenerations.

9. Nonionic detergents are usually not used at high temperatures. The most common types of nonionic agents, the polyoxyethylene condensates, are insoluble in hot water, though readily soluble at room temperatures.

10. In the presence of appreciable concentrations of electrolytes, as during kier boiling and mercerizing, optimum balance for surfactant molecules changes in the direction of lower nonpolar to polar ratio. Under such conditions, for instance, dibutyl sulfosuccinate may be an excellent wetting agent, while dioctyl sulfosuccinate, which is excellent in plain water, would be too insoluble.

These general principles apply mainly to wetting and detergency. A much more elaborate set of rules would be required to cover use of surfactants as finishing and dyeing assistants.

Anionic agents ionize in solution to yield surface-active organic positive ions and small negative ions which are not surface active and which are usually inorganic. These agents are used in much greater quantity than cationic and nonionics. Currently the alkyl aryl sulfonates are gaining an increasing share of the market. Because they are made from petroleum and hence are relatively low in cost, they can be expected to continue to gain over the alkyl sulfates. The most popular alkyl sulfate is sodium lauryl sulfate, made by reducing coconut oil fatty acids to alcohol, sulfating, and neutralizing. The sulfosuccinates have been used widely in the textile industry because of their extraordinary wetting properties. Sulfonated amides such as Igepon T and sulfated monoglycerides of fatty acids complete the roster of popular anionic types. Mention should be made however of those anionic agents which, like soap, contain polar carboxyl groups, but which are resistant to water hardness. One type is a condensation product of fatty acids and protein degradation products, originally used in Europe under the name Lamepon.

Nonionic agents as their name indicates, do not ionize. They generally contain polyoxyethylene chains, made by condensation of ethylene oxide, as their polar groups. The nonpolar groups are often alkyl aryl structures similar to those in alkyl aryl sulfonates. The connecting bond is usually an ether linkage, sometimes an ester linkage. Another well known type of nonionic agent is a polyoxyethylene either of a partial fatty acid sorbitan or mannitan ester.

Many types of cationic agents are available. In the past these agents have been used mainly as bactericides. Their unusual wetting properties, stability in strongly acid solutions, and value in finishing and dyeing operations, have been winning them an increasing market in textile processing. The simplest types are the salts of straight chain fatty amines, such as laurylamine acetate. In general use —though not necessarily for textile processing—are the quaternary ammonium salts such as cetyl trimethyl ammonium bromide and lauryl pyridinium chloride.

DETERGENCY

Detergency is a complex of physicochemical events. Analysis in terms of basic factors has been attempted many times with results that are considerably less than satisfactory. One reason is that results depend on the detergent, the soil, the substratum, temperature, mechanical action, water hardness, etc. Many attempts to specify detergency in terms of physicochemical principles have failed to consider some of these variables.

Detergency is a complex of wetting, emulsification, deflocculation, and electrostatic attraction or repulsion. In some systems true chemical reaction is likewise a factor. Foaming is often unimportant but sometimes can affect results as by hindering mechanical action or, in other cases, by floating away soil.

Nearly all uses of organic detergents call for a builder. The use of the builder will increase the efficiency of performance of the active agent, thus decreasing overall cost. As one example, alkyl aryl sulfonate is as efficient a detergent when built with 60 per cent of sodium sulfate, as is the 100 per cent active agent. Consequently, it is almost never used unbuilt.

Building of laundry soaps goes far back into history. The introduction of synthetics about twenty years ago furnished a whole new field for development. Were it not that the synthetics can be heavily built, they would not offer such keen price competition to soap.

To a very considerable extent building of soaps by alkaline salts is a function of alkalinity. High pH results in ready removal of oily soil from the fabrics because of formation of soap by reaction between alkali and the fatty acids in the soil. The soap is unusually effective because it forms at the oil-water interface, exactly where it is needed. Likewise high buffer value is important to prevent the pH from falling, with consequent destruction of the soap.

With synthetic detergents, the alkalinity of the builder is much less significant. What is more important is specific effect in detaching soil from fabric—probably by means of an electrical charge conferred on soil and fabric *(8)*. Molecularly dehydrated phosphates perform unusually well in this respect.

Another critical physical-chemical property for detergency—not necessarily for wetting—is dispersing power, a combination of deflocculation and emulsifying power. The most widely distributed synthetic, sodium keryl benzene sulfonate, is very poor in this property. Naturally the performance varies with the type of soil to be dispersed. Dispersing power is a measure of the ability of a detergent to keep soil suspended. It is an excellent basis for rough evaluation of detergents in that detergents with poor dispersing power can be eliminated from consideration for many uses *(11, 13)*.

Related to dispersing power, although also subject to more specific attractive forces, is ability of a detergent to prevent soil from redepositing on fabric during the wash. When this property was studied for that compound in comparison with a number of alkaline-salt builders, tetrasodium pyrophosphate and the detergent each showed about the same suspending power at 60°C. over a concentration range of 0.1-0.5, for iron oxide, while other alkaline salts included were somewhat poorer *(5)*. On the other hand, in suspending raw umber, sodium metasilicate, 1:2.1 sodium silicate, tetrasodium pyrophosphate, trisodium phosphate, and sodium carbonate were all more effective than keryl benzene sulfonate. With still another soil, ilmenite black, the decreasing order of effectiveness of suspending power was tetrasodium pyrophosphate, Na_2 0:2.1 SiO_2 silicate, Na_2O: 2.9 SiO_2 silicate, sodium metasilicate, and trisodium phosphate which were all more effective than keryl benzene sulfonate.

When 60 per cent of the detergent was *combined* with 40 per cent of builder, the Na_2O:2.1 SiO_2 and sodium metasilicate gave better suspending power at 60°C. than that of the detergent alone over a general concentration range of 0.1-0.5 per cent. Sodium sulfate present in the same proportion gave slightly poorer suspending power than the detergent alone under the same conditions. At a concentration of 0.1 per cent all four solutions were practically identical in suspending power.

EFFECT OF SOIL MIXTURE

Soil-removal studies with the Launder-Ometer of alkyl aryl sulfonate built with each of three alkaline salts showed that tetrasodium pyrophosphate was slightly more effective than Na_2O: 2 SiO_2 silicate, which were both more effective than sodium carbonate at a total concentration of detergent and builder of 0.2 per cent in 50 ppm hard water. This was obtained with use of artificially soiled cotton cloth obtained from Testfabrics, Inc. In this work different artificially soiled cotton swatches were used, and the order of builder efficiency varies accordingly, even though each of three artificial soils was based essentially on carbon black mixed with mineral and vegetable oils. With artificially soiled cotton cloth from the United States Testing Company, Inc., washed under the same conditions, Na_2O: 3.3 SiO_2 silicate was the most efficient builder at concentrations of builder up to 50 per cent, next came Na_2O:2 SiO_2 silicate, then sodium metasilicate, then tetrasodium pyrophosphate. With the Pennsylvania State College artificially soiled cotton obtained from Foster D. Snell, Inc., washing tests with built detergents showed that the one containing 60 per cent of synthetic detergent was far more effective than the one containing 40 per cent of detergent. With this same soiled fabric, mixtures of the detergent with up to about 75 per cent of sodium metasilicate removed about as much soil as did the synthetic detergent alone.

These experiments are particularly useful in showing the part played by the artificial soil.

EFFECT OF FABRIC

Soap will always be used under the proper conditions of water softness and alkalinity for washing cotton. However, in studies comparing soap with an alkyl aryl sulfonate, the latter proves to be more effective than soap in washing some textiles *(10)*. In this study, made with the aid of the Launder-Ometer, soap was shown to be more effective than an alkyl aryl sulfonate for washing light-weight silk dress fabrics, fiber glass textiles, nylon knit goods, cotton, viscose rayon, and viscose rayon impregnated with a urea-formaldehyde finish. The alkyl aryl sulfonate was more effective in washing wool and acetate rayon. In some cases the differences were not very great between the soap and the detergent, as in washing nylon, which was washed very easily by both detergents. The greatest difference was in washing wool, for which the synthetic proved far superior to the soap.

It is of interest to note that at far lower concentrations than those used in washing (e.g., the concentrations below 10^{-3} Molar which correspond to rinsing concentrations), both tetrasodium pyrophosphate and sodium metasilicate were found to be more effective in suspending ilmenite than sodium lauryl benzene sulfonate. In this connection, potassium silicates with silicate to alkali ratios of 3.3 and 3.9 suspended more ilmenite than a potassium coconut-oil soap at concentrations below 0.1 per cent *(6)*. The alkaline salts were still fairly effective suspending agents at 0.0003 per cent.

WASHING ABILITY OF SOAP AND SYNTHETIC DETERGENTS

The washing equipment makes a great difference in results as shown by a study of the relative washing effectiveness of soap and the nonionic, Antarox A-200. This is an alkyl aryl polyethylene glycol. In the Launder-Ometer the washing effectiveness of 0.25 per cent of detergent product in decreasing order was (1) a 15 per cent solution of Antarox A-200, (2) a built powdered synthetic containing 15 per cent of Antarox A-200, (3) a solution containing 15 per cent Antarox A-200 and 3 per cent low-viscosity carboxymethyl cellulose, and (4) a built soap powder containing 65 per cent of soap. In these washing tests the unbuilt synthetic proved most effective, the built soap least effective *(9)*. However, when the same four products were used in the Terg-O-Tometer, the order of effectiveness for a series of eight soiling and rewashing tests was (1) built Antarox A-200, (2) built soap powder, (3) Antarox A-200 plus CMC, and (4) unbuilt Antarox A-200. In this work soap was nearly as good as the built nonionic throughout all eight cycles. Except for these two closely parallel results, differences among the other agents became more marked with increase in the number of washings.

In the two sets of tests, both the type of equipment and the type of soil were different. Cotton soiled with a carbon-oil mixture was used in the Launder-Ometer tests; a dry soil approximating natural soil in composition was used in the Terg-O-Tometer tests. However, under both conditions a particular nonionic product gave better results than soap.

In a rather extensive study of the washing efficiency of soap in comparison with that of different anion-active detergents, cation-active, and nonionics, ten soaps and twenty-seven synthetic detergents were used for washing artificially soiled cotton and wool fabrics in the Launder-Ometer *(2)*. These results also include the use of distilled water and 300 ppm hard water for the wool washing. In washing cotton in distilled water, soaps proved superior to synthetic detergents. Next to soaps in order of efficiency were sodium alkyl sulfates, which were better than polyethylene oxide esters, which were in turn better than sodium alkyl aryl sulfonates. Fatty acid amide sulfates were poorer than any of these. Under these conditions the cation-active agents such as alkyl dimethyl benzyl ammonium chloride were the poorest of all and were less than 20 per cent as effective as soap. In fact, results with these

were poorer than by washing in water alone. The cation-active agents gave negative detergency.

In washing wool in distilled water the alkyl sulfates were most efficient, then came polyethylene oxide esters. On the average both of these were better than soap. The alkyl aryl sulfonates were about the same as soap, as were also fatty-acid amide sulfonates. The results suggest that most common anion-active and some nonionic detergents have about the same washing effectiveness on wool as soap in distilled water.

In 300 ppm hard water the story is different. At 0.25 per cent concentration, the alkyl sulfates, alkyl aryl sulfonates, and polyethylene oxide esters are all far superior to soap in washing wool. The fatty acid amide sulfonates are intermediate between soap and these synthetics. The results also bring out the fact that in synthetics the per cent of active ingredient can be relatively low without loss of detergent effectiveness. For example a built alkyl sulfate product containing only 19 per cent of active agent was much more efficient in washing wool in 300 ppm. hard water than a soap containing 96 per cent of active ingredient.

Results with built soap-detergent combinations have been reported which compare the relative washing efficiency of two anion-active detergents and one nonionic, in combination with soap and an alkaline builder *(1)*. Each combination contained 60 per cent of pure neutral soap, 25 per cent of tetrasodium pyrophosphate and 15 per cent of one of the following synthetic detergents:

1. Sodium oleyl methyl tauride, 32 per cent active.
2. Polyethylene oxide condensate, 100 per cent active.
3. Alkyl aryl sulfonate, 85 per cent active.

When used to wash artificially soiled fabric in 150 ppm hard water in a Terg-O-Tometer, all three combinations gave increased washing efficiency over that of straight soap. The oleyl methyl tauride showed an increase of 30-40 per cent in washing efficiency over that of soap, the polyethylene oxide product gave an increase of 20-40 per cent, and the alkyl aryl sulfonate gave an increase of 0-15 per cent. The increased efficiency is explained by the phosphate softening the water and allowing the soap to function efficiently in the washing cycle, while the phosphate and synthetic detergent disperse the lime soap formed by the hardness in the water during the rinsing cycle. Thus the soap itself does the major cleaning job. One idea behind such combinations is that they can compete with relatively high-priced built synthetic detergent products in areas of low-and medium-hard water.

TEXTILE APPLICATIONS

Practically all textile operations are improved by the proper use of suitable surface-active agents in the bath. Examples of such typical operations include raw wool scouring, woolen yarn scouring, woolen and worsted piece goods scouring, removal of throwing oils, dirt, and grease from natural fibers, boil-off of rayon piece goods, as dye auxiliaries, for scouring fast-color prints, in finishing, and in scouring crease-resistant and other specially finished goods. Some work has been done to investigate the mordanting of cellulose fibers with cation-active agents. This apparently has not proved to be of economic importance *(7)*.

Nylon yarns can be mordanted with certain cation-active agents and then dyed with direct colors. Many dyestuffs are colloidal in solution and are readily dispersed in the presence of an anion-active agent. The latter tends to retard dyeing, at the same time giving more even penetration and more level shades. Anion-active softening agents serve as plasticizers for textile finishes. Many types of finishes including dulling agents, resins, and latex, are applied with the aid of surface-active agents. In dulling agents, which consist of finely ground pigment particles, the presence of a good suspending agent is important.

Different agents are suitable for different application. For example, sulfated fatty-acid esters have been found almost ideal where rewetting is vital, as in Sanforizing *(3)*. Nonionics are particularly useful in desizing cotton with enzymes, as they do not injure the enzyme activity, as both anion-active and cation-active agents do.

In England the price of soap has increased to a level where it is being replaced by synthetics by some firms for raw wool scouring. This is common today in the United States. Such a change involves study of the concentration and proper building of the detergents, and training of personnel to judge the appearance of baths and fibers under changed processing conditions. Foam from synthetics does not look like soap lather. Experience with it is required for use of this as a factor in judging the bath condition. Both anion-active secondary alkyl sulfates derived from petroleum, and nonionic alkyl phenol ethylene oxide condensates have been used for wool scouring in England. Soda ash is used as the alkaline salt. A neutral salt, sodium chloride ordinarily, is added to increase the efficiency of the detergent in removing oil. The presence of electrolyte has a very direct bearing on oil removal. By omitting it from bowls 2 and 3, 2-3 per cent of wool grease can be left on the wool, which is desired for some uses. The wool will look clean, even with this grease content *(4)*.

Both laboratory and practical results show that knowledge of the basic factors involved is necessary in solving any detergent problem, to be followed up by laboratory research designed to fit the problem *(9)*. A few years ago many of us would have predicted that soap could not be beaten as a detergent in soft water, yet present-day results show improved performance, under some conditions, with suitable built synthetic detergents. This does not indicate the general displacement of soap, but rather that cleaning processes may become optimum in efficiency under many varied conditions by use of combinations of builders and other compounds with soap or synthetic detergents or both *(12)*.

The textile industry applies surface-active agents in more diverse ways and requires more different types of agent than any other field of manufacture. The basic physical chemistry of each process—scouring, carbonizing, levelling, kier boiling and so forth—must be studied in order to determine which agents under which conditions are most suitable for use.

The organic chemists have done their job handsomely and provided us with hundreds of different molecular structures from which to choose. The physical chemists have done a pretty good job—there are some gaps—in determining the specific forces and phenomena upon which the various processes depend. What is needed is thorough, systematic and unbiased application research to bridge the gap between the science and the art.

REFERENCES

1. H. C. Borghetty and C. A. Bergman, *J. Am. Oil Chemists' Soc.* **27,** 88-90 (1950).
2. Margaret S. Furry and Verda I. McLendon, *Am. Dyestuff Reporter* **39,** 209-12 (1950).
3. B. J. Garceau, *Am. Dyestuff Reptr.* **39,** P. 87-90 (1950).
4. J. A. Hepworth, *J. Soc. Dyers & Colourists* **66,** 101-8 (1950).
5. Reynold C. Merrill and Raymond Getty, *Ind. Eng. Chem.* **42,** 856-61 (1950).
6. Reynold C. Merrill and Raymond Getty, *J. Phys. & Colloid Chem.* **54,** 489-97 (1950).
7. Hugh H. Mosher, *Am. Dyestuff Reptr.* **35,** P. 168-73 (1946).
8. Irving Reich and Foster Dee Snell, *Ind. Eng. Chem.* **41,** 2797-2800 (1949).
9. Herbert L. Sanders and Joseph M. Lambert, *J. Am. Oil Chemists' Soc.* **27,** 153-9 (1950).
10. Anthony M. Schwartz, *J. Am. Oil Chemists' Soc.* **26,** 212-15 (1949).
11. Foster Dee Snell, *Ind. Eng. Chem.* **25,** 162-5 (1933).
12. Foster Dee Snell, *Chemistry and Industry* **1949,** 539-45; *Chem. and Eng. News* **27,** 2256-13 (1949).
13. Foster Dee Snell and Irving Reich, *J. Soc. Chem. Ind.* **68,** 98-100 (1949).

METHODS OF EVALUATING DETERGENTS*

CORNELIA T. SNELL
Foster D. Snell, Inc.

BEFORE taking up methods for evaluating detergents to determine which ones may be better in this property or that, it may be well to review briefly the general nature of synthetic detergents.

Detergents—which possess the greatest interfacial activity among the different kinds of surface-active compounds—blend into dispersing and emulsifying agents, which blend into wetting agents. In other words, detergents which will actually remove the dirt from soiled fabric and leave it clean, embody all the surface-active properties, while emulsifying agents embody less, and wetting agents are even more limited; the latter usually do nothing more than increase the wetting power of water on a fabric. Surface-active agents are those which concentrate and orient at an interface between two phases, which result in special effects at that interface.

All surface-active agents from detergents to wetting agents combine in their molecules two different types of radicals: those which are readily water-soluble (e.g., sulfate, sulfonate, hydroxy, oxy, and amide), and those which are readily oil-soluble (e.g., aliphatic hydrocarbons, aromatic hydrocarbons, or both). The balance between these radicals, involving, for example, the number of ethoxy groups on the one hand, and the length and configuration of the hydrocarbon chain on the other, determines the properties of the resultant compound. One can see that an almost infinite variation is possible. Over 800 surface-active agents have been listed which are actually commercial. Hundreds more have been patented. Only a moderate number are detergents, the others are intended for specific applications, largely in the textile industry.

Detergents may be either of two chemical types, anion-active, or nonionic. The former are illustrated by soap, alkyl aryl sulfonates, which constitute the active ingredient in Nacconol and Santomerse, and alkyl sulfates which constitute the active ingredient in the Duponols. Examples of nonionics are Triton X-100, a condensation product of diisobutyl phenol with 9 or 10 molecules of ethylene oxide, and Tweens, condensates of several molecules of ethylene oxide with fatty-acid esters of Sorbitan.

A third class of surface-active agents, not employed as detergents, are cation-active. These are mostly used as disinfectants, but also have special applications in textile processing, particularly in acid solution. The type is exemplified by lauryl dimethyl benzyl ammonium chloride, the active ingredient in Roccal and Zephiran.

DETERGENT EVALUATION METHODS

Some of the methods of detergent evaluation are simple and rapid physical measurements; others are much more complicated and involve many variables, approximating conditions which exist in industrial practice.

SURFACE TENSION MEASUREMENTS—In our laboratory, when evaluating a detergent about whose properties we have no information, the first step is to measure its surface tension in aqueous solution over a range of concentrations. This we do with the aid of the duNuoy tensiometer, which registers the force in absolute units required to pull a standardized platinum ring through the surface of the test solution. The surface tension of plain water is 72 dynes per centimeter. Soap and other good detergents at a concentration of 0.1-0.2 per cent will lower this to 25-30 dynes per centimeter. What does this mean? Lowering of surface tension is a measure of the ability of the solution to displace air. This doesn't sound important until we consider that fabrics always contain air-filled spaces and capillaries; this air must be removed before the fabric itself can be thoroughly wet.

Actually, such a simple physical measurement does not contribute a great deal of positive information as to the possible cleaning efficiency of the detergent. Its value is to eliminate compounds which do not reduce surface tension to the desired level. In other words, this serves as a screening method to eliminate quickly any compound poor in surface-active properties.

INTERFACIAL TENSION MEASUREMENTS—Also with the duNuoy tensiometer, interfacial-tension measurements are made of the detergent solution against benzene containing 0.1 per cent of oleic acid. We use the latter to represent an oily liquid. Oleic acid is dissolved in the benzene to typify the acid nature of soil. That general soil on fabrics is acid has been well established.

Plain water has an interfacial tension against this liquid of about 29 dynes per cm. Soap or other compound high in surface-active properties will lower this to 5 dynes per cm. or less. This shows that a solution of the compound will wet an oily surface much better than plain water will. This also is a simple screening method for eliminating agents poor in surface-active properties.

MEASUREMENT OF DISPERSING POWER—Another measurement in the preliminary study of synthetic detergents is that of dispersing power. In a method recently published (7) two hundred-mesh umber, which is an iron silicate, is coated lightly with a mixture of fatty oil, mineral oil, and fatty acid, to simulate natural soil. After agitation of the treated umber in the sample detergent solution, the relative amount of umber remaining in suspension after a definite period is determined visually in a Parr-type turbidimeter. The more remaining in suspension, the better is the dispersing agent present. By this method soap solution has been shown to be enormously better in suspending power than synthetic-detergent compounds. Suspending power is a very important property since it is at least partly responsible for preventing redeposition of suspended soil when heavily soiled fabrics are being washed. We have seen detergents in the laboratory that removed soil fairly well, but then let it settle out again.

Another method of studying this property is to shake a suspension of ilmenite—a finely ground ore from which titanium oxide is obtained—in the sample detergent solution. After the mixture has stood for a definite period, the amount

* Presented before the June 7, 1950 meeting of the American Association of Textile Technologists at the Builders Club, New York.

of powder remaining suspended is determined by measuring the light absorption in a photoelectric colorimeter *(2)*.

A more direct measure of the power to *prevent redeposition of soil* is to agitate clean fabric swatches in a sample detergent solution carrying a known amount of artificial soil; the latter is usually based on carbon black. The light reflectance of cloth so treated is then compared with that of clean cloth, read in a Hunter Reflectometer or similar instrument. The values are relative. Their significance is judged by experience. Prevention of redeposition is important in most stages of textile processing, but particularly in the early stages where heavy soil is removed from crude fibers. For the cleaning to be effective, soil must not be picked up again to be carried into the next phase of treatment of the fiber.

MEASUREMENT OF WETTING POWER—To measure rate of wetting the Draves test and the canvas-duck sinking test are widely used. Both measure the rate of penetration of the sample solution into cotton skeins or fabric. A drawback is the questionable reproducibility of the cotton surfaces. Use of a woven tape or wick has been suggested as being more convenient. Results with the tape are reported to be more reproducible than with either skeins or squares of fabric *(6)*.

In another form of wetting test, the relative ability of the sample solution to displace oil from a fabric is measured *(1)*. In this test a small square of cotton fabric is passed through a layer of oil and placed at the interface between the upper oil layer and the layer of sample solution. The fabric acquires a coating of oil in passing through the oil layer. The time required for the aqueous solution to displace the oil so that the fabric will sink through the lower layer is measured.

By this method solutions of polyphosphates such as tetrasodium pyrophosphate were shown to be more effective in displacing oil or in breaking the cotton-oil bond that soap solution was. Soap solution in turn was more effective than that of an alkyl aryl sulfonate. The latter plus tetrasodium pyrophosphate was less effective than pyrophosphate alone. The conclusion drawn was that the solution of inorganic salt was superior in its power to wet the fabric preferentially. Its effect was a direct one on the fabric. Any relationship between the pyrophosphate and the detergent, as of "building", was minor. The effect of builders, or salts which promote the efficiency of detergents, will be dealt with in a separate discussion.

WASHING TESTS — The preceding tests all emphasize some one property of a surface-active agent. They are useful for preliminary study or for the investigation of a particular property which may be important. Many properties are involved in actual detergent operations. An approach to this is made by simplified washing tests in a Launder-Ometer. This consists of a rotating shaft carrying 20 one-pint Mason jars which rotate around a central shaft in a housing to permit temperature control. Prepared test solutions are placed in these jars with artificially soiled swatches of cloth. The washing action simulates that of a laundry wheel to some extent, but is very much milder.

Mechanical cleaning is increased by enclosing a definite number of metal or rubber balls in each jar. Results will differ with the number and kind of balls present, with temperature, with period of operation, etc. Even with the most careful control, comparisons are only relative with respect to one another, and apply only to the sample solutions enclosed in the Launder-Ometer at one time.

Dozens of investigators have developed *artificially soiled cloth* according to their own ideas and by their own methods. We prepare artificially soiled wool but no longer prepare the cotton. The General Dyestuff Corporation prepared a complex soil and printed this on specified cotton sheeting as part of a Navy project during the war. Later they made this available to other research groups. The soil contains hydrogenated vegetable oil, mineral oil, oleic acid, and lampblack, as well as a number of other ingredients.

Recently we arranged to obtain standard soiled cotton from The Pennsylvania State College, where it is made under careful supervision at the Ellen Richards Institute. This material we find not only to be the same in degree of soiling from batch to batch, but it shows the same degree of soil removability for different batches, a quality that is even more important. Samples have been stored at Pennsylvania State College for many years without any detectable change in ease of soil removal. Because of the high dependability of this material and its accurate standardization, we have arranged to make it available by commercial sale to workers in this field. In the Launder-Ometer tests, the reflectance of the artificially soiled cotton is read before and after washing. If in the Hunter Reflectometer, this is with reference to the reflectance of a white magnesia block of 100.

Natural soil is not only complex *(8)* but highly variable, which accounts for the numerous combinations which have been used experimentally. For example, one investigator claims that the most frequent sources of actual soil include mud, foods, dust, soot and street-and-garden-dirt *(9)* rather than the more greasy soil used by many workers. Consequently in a study of soil deposition, he experimented with a dry soil sifted and screened from a vacuum sweeper used in a theater. Swatches of fabric were tumbled with rubber stoppers and the dry soil. The fabric swatches were then shaken on a sieve, brushed gently, and the reflectance measured. The results showed a rough correlation with those in which the deposition of liquid-dispersed soil was studied.

An artificial dry soil has been prepared, approximating the composition of samples of natural dirt collected in six large cities *(5)*. The artificial soil contains a mixture of humus, cement, silica, and clay, with small amounts of carbon, iron oxide, organic acids, hydrocarbons, and other compounds. It is applied to fabric with slight moistening, with aid of a modified Schiefer Abrasion Meter, instead of by deposition from suspension in a liquid medium.

In the abrasion method a weighted amount of artificial dry soil is rubbed on to the surface of a cotton swatch. This is much easier to wash out than the heavy greasy soils which have been more commonly used. Repeated washing and resoiling are required to show up differences in detergent action. This is more like practical conditions, where the first washing should make a fabric appear clean. With the heavier soil, one washing will show up differences in detergent solutions, since the soil is never completely removed.

The type of soil may be chosen to meet a particular problem. For example, in a study of detergents for wool *processing*, lampblack was suspended in three different liquids: (1) mineral oil, (2) a fatty oil such as olive oil, and (3) a 50:50 blend of mineral oil and fatty oil *(3)*. A special comparator resembling a miniature dolly washer has been designed in this connection, for study of detergents for wool processing, said to give results closely parallel to those which would be obtained in the mill itself.

A miniature agitator-type of machine has been designed to resemble the usual oscillating domestic washing machine, called the Terg-O-Tometer *(5)*. This provides mechanical conditions of washing more closely related to actual conditions, than does the Launder-Ometer. Since the two types of machines give unlike results with the same detergents, it is necessary to specify which machine is used. However, many laboratory investigations have been carried out with the latter, the Launder-Ometer, since so many samples and conditions can be investigated rather quickly. But the results are not the same as those by actual washing, because (1) the intensity of washing action is less, (2) the ratio of fabric to wash solution

is less—a 3" x 4" swatch in 100 ml. of liquid, and (3) the type of mechanical cleaning is not the same.

For a more complete evaluation, wash tests are run in a regular household washing machine. Such tests may be run in tap water—which is very soft in New York, about 5 grains of hardness—or in artificially hard water. Conditions vary with the work. One procedure is to use a load of 5 pounds of clean towels, with 3 artificially soiled swatches attached. The reflectance of the washed swatches is read. The variables are somewhat more difficult to control than with the Launder-Ometer, but results obtained under actual washing conditions are more valid in terms of what will happen when the product is used under practical conditions.

Sometimes new materials are tested on a larger scale, with the cooperation of commercial laundries. Three or four artificially soiled swatches, and unsoiled swatches to measure redeposition are attached to a regular laundry net of soiled linens. After this is washed by the usual procedure, except by replacement of soap by a detergent supplied by us, the swatches are removed and reflectance readings are made. For such large-scale experiments the work has to be narrowed down to relatively few trials. But by that time the product under test should be in the final stage and ready for commercial production. Such experiments are useful for determining whether a new detergent is more efficient than other products already on the market.

This furnishes an outline of the laboratory methods in general use for evaluating detergents. The planning of work will naturally depend on the nature of the particular problem. In the final stage, conditions of temperature, agitation, nature and concentration of detergent, nature and concentration of electrolytes and builders, water hardness, and other factors, should approximate as closely as possible the conditions of plant baths or wash liquids. Laboratory results may be quite misleading unless this is done.

Although detergent studies may at first sight appear to be empirical, actually much of it is based on sound principles of physical chemistry. This is a field in which an enormous amount of research is being carried out, and one in which great progress is being made. The textile industry should benefit greatly by the knowledge that has been accumulated, even though many problems still remain to be solved.

REFERENCES

1. J. W. McCutcheon, *Soap and Sanitary Chem.* **25**, No. 5, 83 (1949).
2. Reynold C. Merrill and Raymond Getty, *J. Phys. Colloid Chem.* **54**, 489-97 (1950).
3. Clarence L. Nutting, *Am. Dyestuff Reptr.* **39**, P260-1 (1950).
4. Irving Reich and Foster Dee Snell, *Ind. Eng. Chem.* **41**, 2797-2800 (1949).
5. Herbert L. Sanders and Joseph M. Lambert, *J. Am. Oil Chemists' Soc.* **27**, 153-9 (1950).
6. Leonard Shapiro, *Am. Dyestuff Reptr.* **39**, P38-45, 62 (1950).
7. Foster Dee Snell and Irving Reich, *J. Soc. Chem. Ind.* **68**, 98-100 (1949).
8. Foster Dee Snell, Cornelia T. Snell, and Irving Reich, *J. Am. Oil Chemists' Soc.* **27**, 62-8 (1950).
9. Wm. P. Utermohlen, Jr., *Am. Dyestuff Reptr.* **39**, P262-4 (1950).

ABSTRACTS

Registration in Textile Printing

"Technicus", *Rayon & Synthetic Textiles* 31, No. 3, 87-8; No. 4, 82-4, No. 6, 78-9 (1950).

Registration or "fitting" of patterns in textile printing is the operation of adjusting the various portions of a design in its diverse colors so that they all combine, "fit" or register together accurately for the reproduction of the pattern as it is being printed on fabric. The operation requires varying degrees of individual skill according to the method of printing adopted. In this article the author outlines some of the problems arising during the printing of patterns by engraved copper rollers, by silk screens, and by hand blocks.

Discussing printing by copper rollers, he describes in detail the mechanism of the printing machine and the operations whereby the rollers are placed in position and by which the printer is enabled to make the finer adjustments required for accurate registration. Regarding the matter of cloth tension as it passes through the nips of the machine, he states that it is essential that cloth be maintained as nearly as possible at the same tension during its passage from one roller to another until a complete impression of the pattern has been obtained. If any interference with tension arises during printing, it is impossible to keep the various parts of the pattern in accurate registration in continuous running.

The author mentions the difficulty caused by some cloth constructions, particularly crepes, which tend to shrink while passing through the machine. In some cases it is necessary to fix the cloth to the back grey by sticking with gum arabic, to prevent this shrinkage.

Suggestions are offered for the proper sequence of the print rollers in the machine, in order to minimize registration difficulties.—W.H.C.

Shrinkage Control of Viscose Rayon Fabrics

J. A. Woodruff, *Rayon & Synthetic Textiles* 31, No. 5, 71-2; No. 6, 51-2 (1950).

Shrinkage control means that limits are placed on the tendency of fabrics to change dimension during wet cleaning or laundering cycles (washing, drying, dampening, and pressing). All textile fabrics contain, when woven or knit, an inherent shrinkage of from zero to 25 per cent depending upon the fibers used, the fabric construction, and the method of processing. After this processing, the fabrics which are to be used for washable garments must have a known minimum shrinkage under testing conditions representing actual use.

The author lists nine factors involved in shrinkage control: the control possible to obtain; crease resistance obtained; cost of treatment; permanence of hand; possible variations of hand; odor; chlorine retention; effect of dyed shade or other properties; and fabric weighting. He states that these nine points really outline what a converter expects or wants of his finisher for shrinkage control. All but "odor" must be expected to be judged differently with each change of class of fabric.

The various means of obtaining shrinkage control as presently used are listed as follows: reactants (e.g., formaldehyde); bonding materials (e.g., hydroxyethylcellulose); chemical modifications (e.g., alkalis); thermosetting resins (e.g., urea-formaldehyde); and compressive shrinkage

(e.g., Sanforizing). Each of these processes is discussed, with its advantages and disadvantages. The author states that not one of these treatments will alone give a 100 per cent answer towards shrinkage control. Recently, a definite trend has been established in the combining of two treatments (e.g., a reactant with a resin). It is entirely possible that the shrinkage problem may be eventually solved by changes in the physical properties of the viscose rayon staple so that compressive shrinkage of the fabric will provide by itself excellent shrinkage control.—W.H.C.

Less Costly Mercerization Possible Through New Instrument

R. C. Scott, *Textile World* **100**, 106-7, June, 1950.

An instrument for automatically measuring and recording the density of the caustic soda solution in a mercerizing box during the run has been perfected by the Precision Thermometer & Instrument Co., of Philadelphia. Known as the "Densitrol" it consists of a sampling chamber through which the lye is pumped continuously, and which operates hydrostatically through the rise and fall of a submerged plummet as the density of the lye fluctuates. These changes in the position of the plummet are translated to an indicating recorder by means of an induction coil.

It is stated that Joseph Bancroft & Sons Co. have installed a "Densitrol" on one of their mercerizing ranges, and that more uniform mercerization and a saving in caustic soda have resulted.

Developments in the Design of Machinery for Dyeing and Finishing Cotton and Rayon

H. A. Turner, *Textile J. Australia* 24, 1086-94, Feb., 1950 (from Textile Manufacturer).

It is surprising how completely the older textile manufacturing and processing industries have adapted themselves to the distinctive properties of modern manufactured fibers. It is probably true to say that 70 per cent of the innovations in textile machinery design over the past 30 years have originated from the introduction of these new fibers.

It is particularly interesting to trace these developments. These fibers were produced as continuous filament yarns, requiring little twist to compact the filaments. This yarn structure was valued because it offered cheaply much of the appearance of thrown silk, but as the filaments were not as strong as silk, particularly when wet, any rough handling either in yarn or cloth form led quickly to breakage, and brought about serious difficulties in manipulation and deterioration in quality.

These defects were reflected not only in durability, but also in the modification of dyeing properties which occurred when the fibers were overstretched. It was imperative, therefore, that in the operations of winding, sizing, weaving, scouring and dyeing, the tensions to which they were subjected should be as low and as uniform as possible. In the wet form they were much more plastic and malleable than natural cellulosic fibers so that the pressures and tensions to which they were subjected in finishing had to be more carefully regulated.

The author reviews the improvements that have been made in textile machinery to meet these new conditions. He discusses the anticrease process, involving new chemical and engineering problems; improvement in package dyeing of filament rayon; improved design of pads, jigs and becks, and the introduction of the "Williams Unit"; the increasing use of noncorrosive metals in dyeing machinery; drying by radiation and high frequency methods; and recent innovations in calender and tenter mechanisms.—W.H.C.

The Setting of Nylon Fabrics

G. K. Mecklenburgh, *J. Textile Institute* 41, P161-74, April, 1950.

The nylon fiber consists essentially of long polyhexamethylene adipamide chains containing both crystalline and amorphous regions which are bound together by the attractive forces between neighboring amide or peptide groups. The long chain polyamide molecules are randomly distributed immediately after melt extrusion into filaments, and these filaments are then subjected to the process of mechanical stretching, during which the chains become oriented along the fiber axis. The orientation is retained when the tension is released.

The setting of nylon may be defined as the reduction or elimination of subsequent yarn shrinkage, and it enables the yarn to assume the configuration in which it has been held during the setting treatment. This usually, but not essentially, involves the application of heat either with or without the addition of swelling agents.

The method of setting chosen will depend upon the type of fabric and the degree of stability required and also upon the facilities available. Broadly speaking, the methods may be divided into wet setting (with boiling water), steam setting, and dry heat setting.

There is no doubt that properly applied, steam setting produces a much superior degree of set, stabilizing the yarn against shrinking and setting the configuration more permanently than by wet setting methods. The conditions required vary according to the type of fabric, but pressures up to 40 lbs./sq. in. can be used and the time of treatment may be of the order of 20 to 60 minutes.

With dry heat as the setting medium, the method does not require a pressure chamber and the possibility exists of adapting the tenter for such a purpose, with all the attendant benefits of dimensional control. The real interest with this machine lies in the use of temperatures ranging from 380° to 450°F. for short periods of time ranging from 5 to 30 seconds. Too high a temperature or too long a period will cause yellowing of the fiber.—W.H.C.

The Analysis of Commercial Hydrosulfites and Related Compounds by Polarographic Methods

W. Furness, *J. Soc. Dyers & Col.* **66**, 270-7, May, 1950.

Sodium hydrosulfite can be produced commercially with a purity of 98% or more, but for various reasons the textile and dyeing industries prefer a standardized product, containing, say, 90%. The remaining 10% may consist of sodium carbonate, chloride, sulfate, sulfite, metabisulfite, thiosulfate, or trithionate. Experience shows that some of the best chemical methods which have been proposed for the determination of hydrosulfite are not always sufficiently specific to serve for the evaluation of commercial samples.

For example, the complete analysis of samples of partly decomposed hydrosulfites by chemical methods alone always presents difficulties. Determinations of the residual hydrosulfite content by several published precedures might well yield results which differ so much between themselves as to be of uncertain value. In such circumstances polarographic methods are especially appropriate, for besides providing a reliable determination of the residual hydrosulfite, they enable some of the decomposition products, e.g., thiosulfate, sulfide, trithionate, to be readily identified with certainty and estimated with an accuracy greater than that of known volumetric methods. In these applications the dropping mercury electrode is employed; its replacement by a platinum wire microelectrode extends the scope of polarographic methods, enabling the technically important salts of formaldehyde-sulfoxylic acid and acetaldehyde-sulfoxylic acid to be identified.

(Concluded on Page 508)

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Rhode Island Section—

THE APPLICATION OF ENZYMES IN TEXTILES

JULIUS PFANNMULLER and A. NOE

Wallerstein Company

Although the idea that certain ferments, now called enzymes, have a special catalytic effect in promoting chemical reactions associated with living organisms has been developing gradually since 1783, it has been only in the last 35 years that the study of enzymes has made real progress. The author explains why these organic substances containing proteins are so important in catalyzing the chemical reactions necessary for both lower and higher forms of life.

Enzymes have been used for many industrial processes for a very long time, such as the manufacture of beer and cheese and the desizing of textiles. Recently the technical use of enzymes has increased tremendously in both volume and extent.

The difference between carbohydrate-splitting and protein-splitting enzymes is explained. The best conditions of use for these respective enzymes in textile manufacture and their assay are discussed.

ENZYMES, or "ferments", as they are frequently referred to in some literature, are specific organic substances.

Looking at the history of chemistry, we can very well call an enzyme "the forgotten man". Enzymes and their actions go back to the first living organisms on this earth, which probably were single-celled bacteria. Even these had to make use of enzymes, for without them they could not live or reproduce. Enzymes are exclusively produced by the living cell, and it will therefore probably be a long time before we are able to synthesize them.

Though enzymes have existed since the beginning of life, it was very late before they were recognized as organic chemical substances. It might be well to give a short historic outline as to when this "forgotten man" in chemistry was discovered. In 1783 Spallanzani noted that meat was liquefied by gastric juice of hawks. However, he did not recognize what specific chemical brought this action about. In 1836 Schwann described pepsin without recognizing the nature of this enzyme. In 1871 Pasteur, the genius who opened to us an entire unknown world, made a distinction between "organized ferments", such as yeast and lactic acid bacteria, and "unorganized ferments", such as pepsin and diastase. In 1878 Kühne designated the latter class of Pasteurs' "unorganized ferments" as enzymes. In 1894 Emil Fischer became the first man to begin investigations upon which our recent enzyme ideas are based. However, it was only in the last 35 years that a thorough and scientific study of enzymes was undertaken. They were definitely recognized as organic chemical substances of a protein nature, which catalyze certain chemical reactions, mostly those involving naturally occurring organic materials, such as fat, carbohydrates, proteins, etc.

In order to explain the catalytic reaction of enzymes, let us compare them with inorganic catalytic reactions. For example, a typical catalytic process, which utilizes a nickel catalyst and is carried out on a large scale commercially, is as follows:

Hydrogenation of an unsaturated hydrocarbon

$$C_nH_{2n} + H_2 \xrightarrow[\text{catalyst}]{\text{nickel}} C_nH_{2n+2}$$

The same nickel catalyst also can catalyze many other hydrogenations, or reduction reactions. For example, the reduction of a nitrile to an amine:

$$C_nH_{2n+1} \cdot C \equiv N + 2H_2 \xrightarrow[\text{catalyst}]{\text{nickel}} C_nH_{2n+1} \cdot CH_2NH_2$$

Needless to say, the nickel catalyzer, though it may form an intermediate compound, is regained at the end of the reaction in a fully active form, and theoretically, it can be used over and over again for further catalytic processes.

In regard to the catalytic action of enzymes, let us consider a very simple example. This is the hydrolysis of a disaccharide, saccharose, into one molecule of glucose and one molecule of fructose. The equation is as follows:

$$\text{saccharose} + H_2O \xrightleftharpoons[\text{catalyst}]{\text{enzyme invertase}} \text{glucose and fructose}$$

Here we already have a different type of catalytic reaction as compared with the inorganic catalysis, since the reaction is reversible. Outside of the living cell, the reaction proceeds nearly 100% in the direction of the cleavage (hydrolysis). Within the cell, however, the enzymes are very largely used for catalyzing the opposite reaction, that is, the synthesis of a disaccharide from glucose and fructose.

Another example of an enzymatic catalysis is the hydrolysis of another disaccharide, maltose, into two molecules of glucose:

$$\text{maltose} + H_2O \xrightleftharpoons[\text{catalyst}]{\text{enzyme maltase}} 2 \text{ glucose}$$

For this reaction another enzyme has to be employed, called maltase. The enzyme invertase would have no action whatever upon the substrate maltose. Here again we have another decided difference as compared with inorganic catalysts, since all enzymes are *very specific* in their action.

Theoretically, all enzymes, which are employed for catalyzing reactions, can be used over and over again for performing the same specific catalytic cleavage and synthesis reactions, respectively. In the case of both the inorganic and organic catalyst, it is now believed that the catalyst enters into the reaction chemically, but at the end of the reaction it is again obtained in an unchanged form.

While the life of both the inorganic or the organic enzyme catalyst is theoretically unlimited, from a practical standpoint however, the life of every catalyst is limited.

In the case of an inorganic catalyst, the surface of the nickel may become poisoned or changed so that it loses its catalytic action and has to be regenerated. In the case of enzyme catalysts there are even greater limitations, since we have to deal with very complicated and sensitive organic compounds. Destruction of the organic catalysts by heat, by traces of certain metals or by other inactivators may occur, and with it stoppage of the catalytic enzyme action.

There are certain factors which cause

* Presented by Pfannmuller before Rhode Island Section on January 27, 1950.

the destruction or the denaturing of enzymes:

(1) HEAT. All enzymes are more or less thermolabile, and practically all enzymes in aqueous solution are irreversibly destroyed by prolonged boiling. Most enzymes, however, are destroyed at a much lower temperature according to their sensitivity to heat, especially when exposed for a longer period of time.

(2) THE CONDITIONS OF ALKALINITY OR ACIDITY. The conditions of alkalinity or acidity are now commonly measured and expressed in terms of pH. All enzymes have a rather limited pH range, and at pH values far outside of the specific range they are destroyed.

(3) INFLUENCE OF CERTAIN CHEMICALS. According to the particular enzyme being used, certain chemicals may exert a detrimental influence, which may even destroy the enzyme in a very short time. Special attention should be called to the fact that many salts of certain heavy metals (for example, mercury salts) destroy most of the enzymes rapidly.

As mentioned previously, enzymes are very specific in their action. If each relatively similar disaccharide requires its own specific enzyme, it cannot be expected that enzymes that attack proteins will exert any influence on carbohydrates or fats, etc., and vice versa.

The industrial application of enzymes goes back to prehistoric times. Probably the first industrial application of enzymes was the conversion of grape juice into an alcoholic beverage by an enzyme complex contained in yeasts, which are naturally present upon the skin of grapes. The desire of man to obtain another more abundant source of a stimulating alcoholic beverage probably brought about the industrial use of another enzyme process, namely, the conversion of starch-containing products into fermentable sugars, which in turn can be converted into alcohol. This fundamental process of brewing beer was already carried out on a rather large scale by the ancient Egyptians.

Only in rather recent times are enzymes being used for many other industrial purposes on an ever increasing scale. Our modern food industries make extensive use of enzymes. To name just a few, the conversion of corn starch into sweet syrups is accomplished by enzymes. In the candy industry, enzymes are used to convert cane sugar into the sweeter tasting invert sugar. In recent years, proteolytic enzymes are being sold for tenderizing meats, for the manufacture of protein hydrolysates, for the clarification of beer, and for the manufacture of cheese.

Proteolytic enzymes are also used on a large scale in certain stages of leather manufacture. For example, they are employed in the process called puring, or bating, which consists of subjecting unhaired skins or pelts to enzymatic action, so that a softening effect and removal of certain proteinaceous constituents is achieved.

Being generally acquainted with enzymes, we can now talk about their application in the textile industry. Here we are chiefly concerned with two classes of enzymes:

A. Enzymes which act upon starch, called amylolytic enzymes, or amylases.

B. Enzymes which act upon proteins, such as gelatin, casein, etc., called proteolytic enzymes, or proteases.

In both cases, the use of enzymes is restricted to the degradation of the starch or proteinaceous material, respectively, into chemical compounds of lower molecular weight. This is accomplished by breaking up large molecular chains by hydrolysis.

Let us now consider more in detail the action of enzymes upon starch. Commercial enzyme preparations are used for the production of more or less viscous starch solutions, which are used in sizing; or commercial enzyme preparations are employed for solubilizing the starch in grey goods, a process commonly called desizing. To make it quite clear, there is more than one single specific enzyme which hydrolyzes starch. These different enzymes that can act on starch also produce very different cleavage products. For practical purposes, we divide these starch-attacking enzymes into two large groups:

(a) The group called α-amylases.

(b) The group called β-amylases.

α-amylases cleave the starch largely into α-maltose, which is characterized by a high specific rotation or negative mutarotation.

β-amylases break down the starch into β-maltose, with a low specific rotation.

α-amylases are the starch-liquefying or dextrinizing enzymes, whereas the β-amylases are generally called the saccharifying enzymes.

It would be best to see how these groups of enzymes act upon starch. First of all, I should mention that starch itself, that is, the starch granule suspended in cold water, is only slightly attacked by enzymes. Therefore, it should be understood that reference is being made to starch that has been swelled and heated in water, either previously or during the process of enzymatic attack. The swelling and bursting of the original starch particles can also be accomplished at lower temperature by the addition of some chemical agent, for example, by the addition of alkali. When we boil starch in water the original small particles take up water, become swollen and burst, and lose their original microscopic structure. At a temperature, which, however, is not as sharply defined as the melting point of chemical compounds, but which is characteristic of the kind of starch, the mass forms a gel, which is more or less stiff in proportion to the starch concentration. If α-amylase is added at this point, or if α-amylase is present in the water used for heating the starch, hydrolysis sets in and the paste begins to liquefy, more or less rapidly. The starch molecule is split into large fragments, dextrins, and then further into smaller molecules of a dextrinous nature, and maltose and glucose as well.

If we add only enzymes of the β-amylase type to the starch gel, it is *not* liquefied. However, a certain amount of maltose is formed. The conception of the structure of starch in Figure 1 lends an explanation of the enzymatic attack.

Amylose can be completely hydrolyzed to maltose by β-amylase. However, the latter has only a very limited action on the amylopectin component of the starch. β-amylase can split off maltose molecules only from the end of the chain, but its action is stopped when it reaches a branch-point. Very large molecules of residual dextrins remain, which are still highly viscous and are not readily soluble in water.

α-amylase, however, can break the amylopectin chain between the branch-points, leaving maltose and much smaller dextrin molecules, which are of low viscosity and easily soluble in water.

Figure 2 illustrates the attack of α-amylase as well as β-amylase upon amylopectin, according to Kurt H. Meyer.

Even in the attack of starch by α- and β-amylases combined, however, the degradation products do not consist entirely of maltose. Low-molecular-weight dextrins, mainly trisaccharides, are left in the amount of about 20%. For specific purposes, especially for the production of glucose from starch, the remaining 20% can also be broken down again by another group of enzymes, which we call glucosidases and which only recently are being studied more thoroughly.

Having a general picture of what happens during the breakdown of starch, we can now consider more details of the technical aspects. If we want to use starch for the manufacture of sweet-tasting syrups or dextrose, we want to break down the starch as far as possible

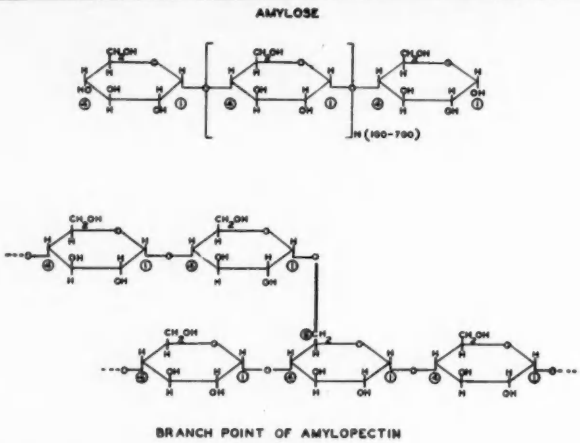

Figure 1

The starch consists of two different polysaccharides. About 20% of the starch consists of a water-soluble component called amylose, in which about 100 to 700 molecules form a long unbranched chain.

About 80% of the starch consists of amylopectin, which is composed of giant branched molecules built up from about 500 to 2000 glucose molecules. These giant molecules are branched on an average at every 25th glucose unit.

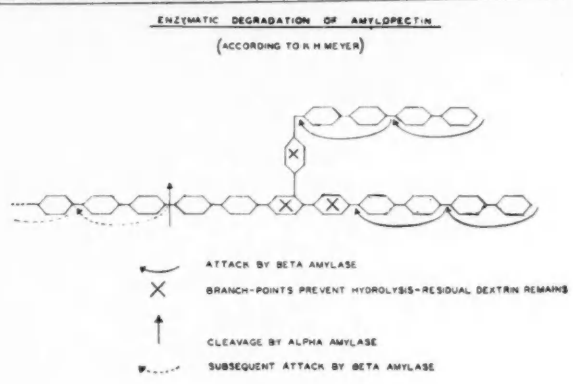
ENZYMATIC DEGRADATION OF AMYLOPECTIN
(ACCORDING TO K. H. MEYER)
ATTACK BY BETA AMYLASE
BRANCH-POINTS PREVENT HYDROLYSIS-RESIDUAL DEXTRIN REMAINS
CLEAVAGE BY ALPHA AMYLASE
SUBSEQUENT ATTACK BY BETA AMYLASE

Figure 2

into glucose molecules. Glucosidases and another enzyme, maltase, which cleaves maltose into glucose, should be employed with the α-amylase.

However, if we want to make a starch paste, we certainly would not want to hydrolyze the starch all the way into sugars. We want to stop the reaction at a certain point where the starch is more or less of a pasty nature. For this purpose, therefore, we use α-amylases and stop the reaction by destroying the enzymes at the desired point. This can be achieved by killing the hydrolyzing enzyme by means of boiling, acidifying or adding some chemical inactivator, or by a combination of these methods.

In the desizing process for textiles, the conversion products of the starch are of no interest as they are not utilized. The only requirement is that they be water-soluble in the desizing bath and that they wash out readily during subsequent scouring and washing operations.

Since α-amylases degrade the starch into such products, starch-splitting enzymes of this type are used for desizing. Commercial desizing enzymes are of three different origins:

(1) Bacterial amylase, which consists of an α-amylase-type enzyme.

(2) Malt amylase, which is standardized according to the α-amylase content, and which in most cases contains some β-amylases. However, the latter do not enter into the desizing process at all, especially if higher temperatures are employed.

(3) Pancreatic amylase of animal origin, made mainly from hog pancreas. This type of enzyme contains the α-amylase type.

These three types of α-amylases are of different origin, and their characteristics are also entirely different in the following respects:

(a) In their pH ranges of action.

(b) In their optimum temperature of reaction.

(c) In their resistance to destruction by heat.

(d) In their different behavior towards stabilizers, especially to sodium chloride and calcium salts, which act as stabilizers for many different amylases.

Comparative data can be seen in Table I.

As I mentioned before, it is necessary to swell the starch or, in the case of a dry starch paste on the warp, to reswell the starch film. This swelling, of course, proceeds at a much faster rate at higher temperatures. I think, therefore, that the conclusion can be drawn that where a rapid desizing is desired, high temperatures in the desizing bath as well as a suitable high-temperature-desizing enzyme should be employed. This brings us to the question of what temperature should be used for practical desizing.

The general law of chemical kinetics states that the velocity of a reaction increases with increasing temperature. Arrhenius mathematically expressed this law *(1)*. For practical purposes the relation exists that each rise of 10°C. doubles or triples the velocity of reaction. This means that the higher the temperature, the more quickly is the starch solubilized by an enzyme. There are, however, certain limiting factors. The factors are that all enzymes are destroyed at boiling temperatures, and that, according to the *specific enzyme,* more or less rapid destruction also occurs at temperatures far below the boiling point. The destruction of the enzyme, therefore, runs contrary to the speed of its action. From a practical standpoint, we must consider the most economic conditions we should employ and determine the best *temperature of use* for *each type* of enzyme. The time in which we want to achieve a certain result with a specific enzyme is also very important. It often is better and more economical to use a higher temperature, though we know that more or less destruction of the enzyme occurs, in order to obtain the full benefit of the increased velocity of its action at high temperatures.

The practical application of these considerations is illustrated in Figure 3.

Cotton twill containing about 10% of starch size was padded with enzyme solution at different temperatures and was laid over at the padding temperature for 2 hours.

The abscissa in Figure 3 shows the desizing temperature and the ordinate the relative enzyme concentration necessary to obtain the same degree of desizing. The concentration at 150°F. is taken as 100. You see that at 110°F. about four

TABLE I
pH AND TEMPERATURE RANGES OF DIFFERENT AMYLASES

Enzyme	pH Range	Temperature Range	Effect of NaCl	Effect of Ca^{++}
Malt α-Amylase	4.5-5.5	130-150°F.	—	+
Malt β-Amylase	4.5-5.5	105-125°F.	—	—
Pancreas	6.8-7.5	105-130°F.	+	+
Bacterial	6.0-7.5	150-185°F.	+	+

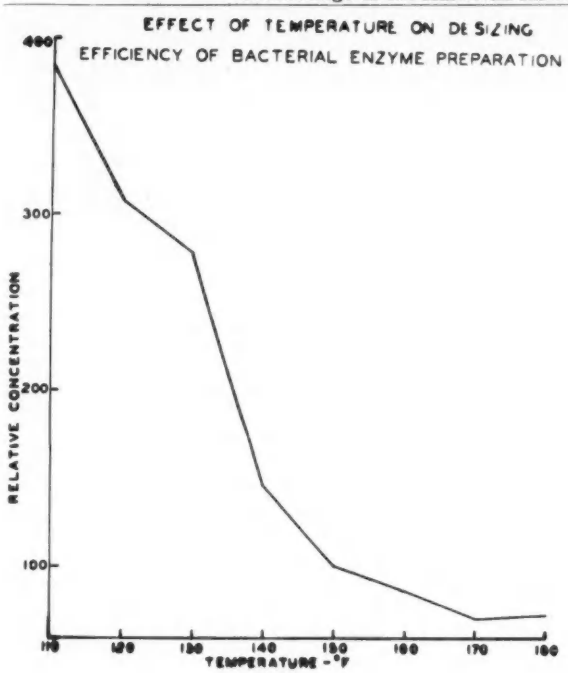

Figure 3

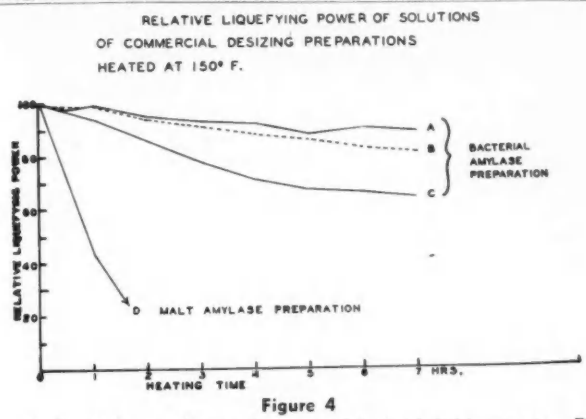

Figure 4

A, B and C are solutions of commercial bacterial desizing agents. D represents a desizing agent derived from malt.

times as much enzyme is necessary as at 150°F. At 170°F. the same result can be accomplished with 70% of the concentration which is necessary at 150°F.

In the mill it is a practice to make up the desizing solution for an entire run and to feed it from a tank to the padder or jig. In order to avoid temperature losses it is desirable to hold the temperature of the desizing solution in the tank close to the desizing temperature in the jig or padder. As enzymes are subject to destruction by heat, the heat resistance of a diluted enzyme solution is of the utmost importance.

Figure 4 shows the liquefying power that remains if 1% commercial enzyme solutions are held at higher temperature. The enzyme solutions were held at 150°F. for seven hours. Every hour the enzyme activity was determined. The initial power is assumed to be 100%.

Pancreatic desizing preparations have not been included, as commonly these desizing agents are too unstable at this temperature; generally they are not employed at high temperature. It can be seen that bacterial amylase preparations are more stable at a high temperature than malt preparations. There are, however, differences of heat stability between commercial desizing preparations, although they all may be of bacterial origin.

After 7 hours, preparation A is still 89% active, C is 64% active. The differences in heat stability are not due to the different nature of the enzyme but are due to the various methods employed in manufacturing the commercial product.

When we talk about enzyme preparations as used commercially, we should bear in mind that technical preparations are far from pure crystalline enzymes. The live cell does not produce pure, individual enzymes, but mostly a variety of different enzymes, which are contained in all commercial preparations. It is therefore necessary to standardize these enzyme preparations exactly for the strength of the specific enzyme that is desired.

For example, let us consider bacterial, pancreatic or malt enzymes. In addition to amylases, they contain varying amounts of proteolytic enzymes, which play only a subordinate role in desizing goods that contain starch. Any laboratory method for determining the desizing power of an enzyme preparation, therefore, has to be based accurately upon the practical application. Before such a method is adopted in the laboratory, many comparative desizing experiments have to be carried out to make absolutely certain that the laboratory method in question corresponds to the practical application. We have found that a determination of the liquefying power of an amylolytic enzyme, based on a standard starch paste, which is liquefied to a definite viscosity, gives an accurate picture of the enzymatic action that is desired in actual desizing. I shall briefly describe two of the methods that are used in our laboratory.

First, I would like to talk about the starch substrate, which is used in our laboratory tests. The different types of starch, such as potato, corn, wheat, tapioca, etc., as you all know, show different characteristics in their behavior toward enzymes. Even starch of the same origin varies greatly. In selecting our starch substrate, therefore, we buy a large quantity for this purpose, then standardize the entire lot and use it exclusively for test purposes in the laboratory. This factor of absolute uniformity is of the utmost importance in order to obtain uniform and reliable results for the determination of the enzymatic strength.

The method which I shall now describe consists of adding the same amount of starch slurry into highly standardized glass tubes of a small diameter, and then adding different amounts of enzyme to each tube. Figure 5 shows 8 glass tubes, each containing the same amount of starch suspension, but with different amounts of enzyme added in geometric progression beginning with the highest amount at the left.

The total volume of each tube is adjusted correspondingly by addition of water, as shown in Figure 6.

The tubes are transferred to a constant temperature bath at 75°C. and vigorously stirred. After gelling has taken place, only occasional stirring is necessary.

After exactly one hour the tubes are immersed into a boiling waterbath and held there for 5 minutes in order to kill the enzyme. The stirring rods are withdrawn. The tubes are then cooled to 20°C., and after ten minutes they are held at an angle of 45°C. and allowed to run out for 30 seconds.

If the strength of the enzyme solution was judged correctly, in a few tubes which contained more enzyme, the starch has been entirely liquefied. In a few other tubes which contained less enzyme, the starch was not entirely liquefied. In this particular example, illustrated in Figure 7, the starch is not quite liquefied in tube 5. In the first four tubes the starch has been completely liquefied, whereas in the last three tubes the starch

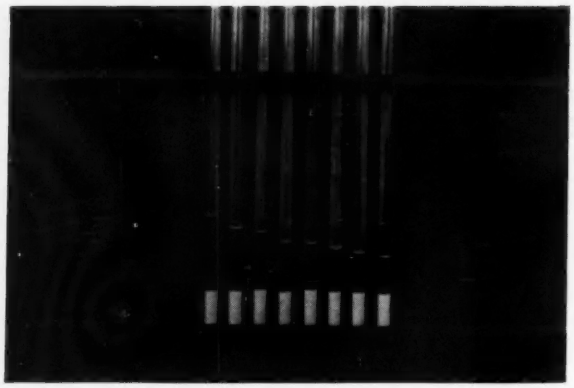

Figure 5

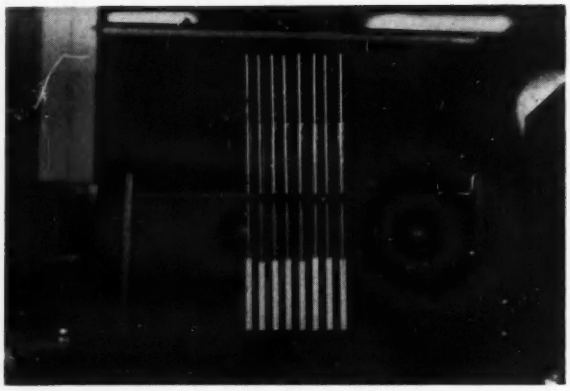

Figure 6

is not liquefied. The tube that contained the smallest amount of enzyme causing complete liquefaction is taken as the endpoint. In this particular case, the amount of enzyme would be between the amount added to tube 4 and tube 5.

If the dilution necessary to bring about this liquefaction is taken into consideration, the strength of the enzyme preparation can then be calculated. It should be mentioned that, after a short training period, any skilled laboratory technician is able to obtain very uniform and reliable results by this method.

Speed, simplicity of manipulation, and greater accuracy have led us to develop another testing method in our laboratory. However, this method requires some mechanical equipment.

In this method a slurry of standardized starch and enzyme is placed in nickel tubes, which are standardized exactly as to wall thickness, diameter, height, etc. The tube is first inserted into a constant-temperature waterbath at 30°C. for 10 minutes, and then the slurry is stirred mechanically. The tube is next transferred quickly into a constant-temperature bath at 75°C., and the mixture is stirred again mechanically until a stiff paste has been formed. A specially standardized plunger, of a type similar to that of a hydrometer, is placed on top of the paste.

As the paste softens from the action of the enzyme, the plunger starts to sink. The time is noted when the plunger has sunk to a definite depth, which is indicated by a mark on the stem of the plunger. The time elapsed between the insertion of the tube into the 75°C. waterbath and the time when the plunger reaches the indicated depth is recorded. The nickel tubes, stirrers and plungers are illustrated in Figure 8.

The equipment employed for the actual test is illustrated in Figure 9. The plunger in the right tube is in the process of sinking, while the plunger in the left tube has not as yet started to sink.

The time at which the plunger sinks to the mark of course varies according to the amount of standard enzyme preparation in the tube. The required time is plotted against the enzyme concentration so as to establish a time-concentration curve. In the testing of an enzyme preparation of unknown strength, the sinking time of the plunger gives an exact measure of the enzymatic strength calculated on the time-concentration curve. A typical time-concentration curve is illustrated in Figure 10. The reciprocal value of the enzyme concentration, expressed as liquefying power, was used as the ordinate.

This test can easily be carried out even by a rather unskilled laboratory technician since the main difficulty of preparing a reproducible uniform starch paste has been overcome by elimination of the human element through mechanical stirring operations.

Needless to say, if enzymes of different origin are tested, a time-concentration curve has to be experimentally established for each enzyme before any quantitative measurements can be made. The results obtained by using this method of enzymatic assay are accurate within 3%.

The two methods previously described are especially applicable to α-amylases, which possess high heat resistance. If we have to evaluate the strength of enzymes, which are so sensitive at higher temperatures that they cannot be added during the gelatinization period, other methods must be employed.

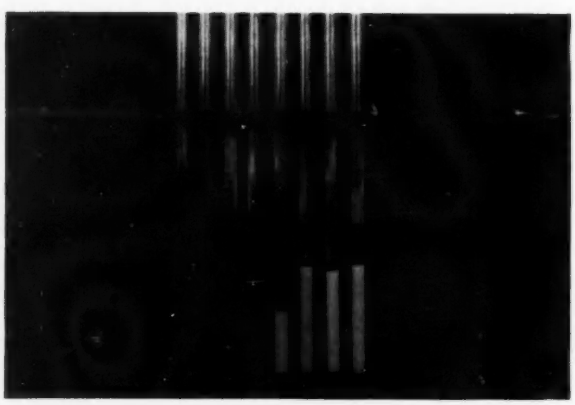

Figure 7

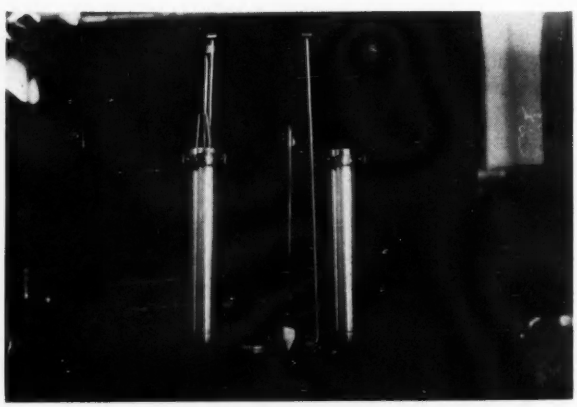

Figure 8

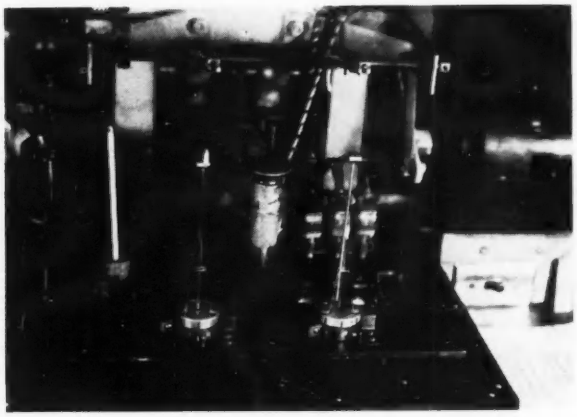

Figure 9

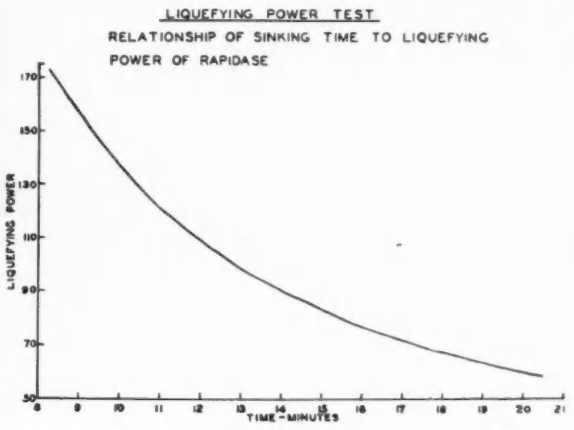

Figure 10

Without describing such methods in detail, we should at least mention a few. Some are based on the liquefying properties, such as the method of Jozsa and Gore *(2)* or Jozsa and Johnston *(3)*. Others are based on the dextrinizing properties, such as the U. S. Pharmacopoeia test *(5)*, the method described in *Analytical Methods for a Textile Laboratory*, AATCC, 1949. Still others are based on the formation of reducing sugars. Dextrinizing and saccharifying methods have to be interpreted with caution on account of the role of β-amylases, except for the methods which eliminate the action of β-amylases, for example the method of Sandstedt, Kneen and Blish.

Finally, allow me to talk on the evaluation of certain test methods which the textile technician and chemist uses for judging the desizing operation. The only action one can expect from a starch-splitting enzyme is that it breaks down a starch paste or gel, or starch film, insoluble in water, into water-soluble compounds. These soluble substances, of course, have to be *washed out of the goods*. We know of *no* enzyme or *group* of enzymes which breaks down starch into simple compounds, such as CO_2 and water. Though a main part of the water-soluble conversion products of the starch are contained in the desizing bath itself, nevertheless the cloth which has just been removed from this bath will contain some cleavage products, such as sugars, low dextrins, etc. They are present in the same proportion as they are dissolved in the liquor of the desizing bath itself, and can be removed only by proper washing.

For illustration purposes, let us suppose that we washed our clothes in ordinary ocean or sea water. Although the clothes may have been reasonably cleaned, salt from the sea water still remains in the cloth. In order to remove the salt, we must wash the clothes in fresh water. The same has to be done with desized goods. In order to remove the conversion products properly, they have to be completely removed by washing or scouring.

A test that is quite generally used by the practical man in the mill is to test the completeness of desizing by means of the iodine reaction with starch. The iodine-starch reaction is one of the most sensitive chemical reactions known. This test can show the presence of 50 micrograms, or one part of starch in 50,000 parts of water *(4)*. Such an amount cannot be weighed, of course, even on the finest analytical balance. Therefore, it is at least very difficult to judge the completeness of desizing by a test with iodine. Desized goods may contain a high amount of starch degradation products, which no longer show a color reaction with iodine, and therefore have been improperly desized, although the iodine reaction is practically negative. The opposite is also true.

After discussing the enzymatic action of suitable amylolytic enzymes upon starch in the desizing operation, it might be well to dwell on the practical desizing operation for a short time. Enzymes that are used for desizing have to attack the starch film, which has dried and hardened. Before any enzymatic action can take place, this film has to be rewetted and the enzyme has to penetrate to the rewetted film. Quick penetration of the enzyme solution obviously should aid in practical desizing. The construction of the fabric, composition of the size, thickness of the starch film, etc. are very important factors. In addition to high desizing temperatures, the use of proper wetting agents, which allow the enzyme solution to penetrate quickly to the warp, is in most cases very beneficial for speedy action. However, not all wetting agents are compatible with these enzymes. As a matter of fact, many of them show a highly destructive influence when applied in the same bath with the enzyme. Many good wetting agents are known, however, which do not interfere with the action of enzymes. It is my suggestion that, if any textile mill wants to use certain wetting agents in the desizing bath in the presence of an enzymatic preparation, the mill should first inquire as to whether the particular surface-active agent is compatible with the enzyme preparation that they use in their process. Tests for evaluating the compatibility of different wetting agents with specific enzymes is one of the important tasks for the practical enzyme chemist.

Detergents are also used with good success for quick washing out of starch-degradation products.

In conclusion, in regard to the starch desizing problem, I would like to mention that no laboratory that controls the sale of enzymes to the textile industry can dispense with the practical desizing test, which measures the exact amount of starch removed and the residual size retained in the goods. Such tests can conveniently be carried out on a small scale in a laboratory with the same cloth which is to be desized. If there is any trouble in mill desizing, it often can be ironed out easily by changing certain physical conditions, which can be determined by laboratory tests.

Let us now briefly consider the other type of enzymes which are commercially used in the textile industry, namely, the PROTEASES.

This type of enzyme is used for removing protein sizes, which, in practically all cases, consist of gelatin. Gelatin size is especially used on rayon and other synthetic goods. This same type of proteolytic enzyme is also used for the degumming of silk. A starch-splitting enzyme would of course be useless for

this purpose.

Practically all of the commercial desizing preparations which are standardardized and used for solubilizing starch, also contain proteases. Those of bacterial or pancreatic origin contain the largest amount of proteolytic enzymes, while malt preparations contain the least. Since the proteolytic enzymes in such preparations are not standardized, the varying small amounts present cannot be used economically for the problem of removing gelatin size. The proportion of proteolytic enzyme to amylolytic enzyme varies greatly.

Commercial desizing preparations that are intended for the removal of gelatin or other protein sizes or for the degumming of silk have to be standardized on a protein substrate. This insures good and uniform results in practical application. However, such preparations contain some starch-splitting enzymes, which are present in varying and unstandardized proportion.

Gelatin sizes are used mostly on goods where high temperatures usually are avoided. Most gelatin-splitting proteases do not tolerate the very high temperature which can be applied to the starch-splitting α-amylases of bacterial origin. Temperatures of about 120°F. are best suited for their practical application. Commercial desizing preparations should not only work at this temperature, but should be designed so that diluted enzyme solutions also keep their strength at about 120°F. for at least ½ to 1 hour without any appreciable loss of enzyme strength.

I would like to mention briefly the influence of pH upon the action of this group of enzymes. Most of the gelatin-splitting proteases are inactivated or destroyed at pH values below 5.4. Since a pH range which is slightly on the acid side is generally desired with synthetic goods, care should be taken not to have a dangerous pH in the desizing bath if proper enzyme action is expected.

I would like to outline briefly one method for testing gelatin-splitting enzymes. An established amount of a highly standardized gelatin, which is the substrate, is weighed into a standard aluminum beaker; a buffer solution of about pH 8.0 is added; and this mixture is then placed in a waterbath at 45°C.

The same precautions for standardization of the gelatin substrate apply as were discussed in detail in connection with the starch substrate. After the gelatin has been carefully dissolved, the beaker is transferred to a waterbath at 37°C. (98.6°F.). A certain amount of the diluted enzyme solution is added, stirred well, and then kept for one hour, during which time the enzyme action takes place. In this test it is not necessary to destroy the enzyme.

The next step is to transfer the liquefied gelatin into an Engler viscosimeter. Without an addition of enzyme the time of outflow is 6:00 minutes. When enzyme is added, the viscosity of the gelatin is reduced and, therefore, the stronger the enzyme action, the lower the viscosity becomes. We add such an amount of enzyme as to obtain an outflow time of about 3:00 to 4:00 minutes. By constructing a time-concentration curve, similar to the one mentioned in connection with testing α-amylases, the strength of a proteolytic enzyme preparation can then be determined. This method has an accuracy within 3%, and a skilled technician can easily be trained to obtain very reliable results in a relatively short time.

The field of known proteases is even larger than that of the amylases. It is also rather more complicated. These different specific proteases enable us technically to perform many processes from the coagulation of proteins, as it is carried out in the cheese industry, to the dissolving and degradation of the largest protein molecules into their respective building blocks, the amino acids. Enzymatic hydrolysis has enabled us to obtain certain amino acids (for example, tryptophane) which would be destroyed if normal chemical methods of protein degradation were employed.

The development of industrial enzyme chemistry has taken place only rather recently. The study of enzymes and their action in the living cell as well as outside the living cell was one of the greatest tools for understanding the biological processes of life. Enzymes are also being applied to correct irregularities that take place in both human and plant cells. Their action is indispensable in the present research program for cancer as well as for the study of other diseases that plague mankind.

REFERENCES

(1) Arrhenius, *Zeitschr. Physik. Chem.*, 4, 226; 1889.

(2) *Ind. and Eng. Chem., Analyt. Ed.*, 2, 26 (1930).

(3) *Ind. and Eng. Chem., Analyt. Ed.*, 7, 1935.

(4) *Chem. and Ind. of Starch*, Ralph W. Kerr, 1944.

(5) *U. S. Pharmacopoeia IX and XIII.*

29th ANNUAL CONVENTION

WENTWORTH-BY-THE-SEA

PORTSMOUTH, N. H.

Auspices of the

RHODE ISLAND SECTION

SEPTEMBER 28-30, 1950

Robert W. Brewer, Outing Chairman; Charles W. Dorn, Retiring Section Chairman; Paul W. Luck, Section Chairman

Report of New York Section Outing

THE annual outing and golf tournament of the New York Section was held on June 16th at the North Jersey Country Club, Paterson, New Jersey. In addition to the golf tournament, there was a driving contest, putting contest, a horseshoe pitching tournament and card games. A buffet lunch was served and the festivities concluded with a banquet in the evening following which prizes were awarded.

Results of the golf tournament were as follows:

LOW GROSS—MEMBERS: Competition for the Cup resulted in a triple tie between R. Brewer, J. Kominos and E. Stowell with scores of 80 each. A playoff has been arranged for the near future.

2ND LOW GROSS—MEMBERS: M. Mulqueen, 81.

3RD LOW GROSS—MEMBERS: R. H. Bauman, 82.

LOW NET—MEMBERS: E. Staab, R. H. Bauman, M. Mulqueen, 72.

2ND LOW NET—MEMBERS: R. Stutz, 72½.

3RD LOW NET—MEMBERS: H. Young, E. Stowell, 73.

1ST LOW NET—GUESTS: A. K. Saisseline, 73.

2ND LOW NET—GUESTS: G. Newcombe, E. Henckler, 74.

3RD LOW NET—GUESTS: W. L. Cavanaugh, E. Schwartz, R. Cave, 75.

The Calloway System of handicapping was used in determining the above net scores.

1ST KICKERS: R. Bume, C. A. Laskey, H. Youngster, S. I. Parker, R. H. Bauman, F. Kern, Sr., E. Artim, 74.

2ND KICKERS: A. Rodcap, D. Lipman, C. K. Wall, G. Battye, C. F. Russel, A. Martone, P. Purcell, R. L. Burnett, 76.

3RD KICKERS: F. J. Hecht, W. L. Cavanaugh, D. Shapiro, R. Rabinowitz, B. Lanza, M. Mulqueen, L. Brick, G. Wiseman, 73.

HIGH GROSS: A. Caska, 153.

HIGH ON 17TH: F. Eckstrand, L. J. Roos, E. Artim, 11.

HIGH ON 8TH: J. Sabattelli, 9.

PUTTING CONTEST: D. Bauman, H. Kinsey, J. Ferguson, 33.

DRIVING CONTEST: Class A—John Kominos, 249 yards; Class B—Emil Grilli, 243 yards; Class C—S. Johnson, J. Fowler, A. Saisseline.

The results of the horseshoe pitching contest were announced as follows: C. Pruiskma, 1st; J. McKay, 2nd, W. Neff, 3rd.

During the dinner the Chairman, Charles W. Dorn, announced that a Student Chapter would be formed at Fairleigh Dickinson College, Rutherford, New Jersey, with the opening of the Fall session. It has been subsequently announced that Herbert R. Mauersberger of the college staff has been appointed faculty advisor and will be in charge of the new chapter. This is the first student chapter in the area of the New York Section and students in both day and evening sessions will be eligible for membership. Dr. Peter Sammartino, Fairleigh Dickinson's president, was introduced to the members by Mr. Dorn.

Special awards were made to the three oldest Association members present at the outing: Carl Puller, P. J. Wood and R. Fitzgibbon. It was also announced that Mr. Puller and C. L. Knights had made 7 spades doubled during a bridge game in the afternoon.

The committee in charge of the outing consisted of Robert W. Brewer, *Chairman,* Robert F. Holoch, Weldon G. Helmus, John H. Hennessey, James J. Marshall, Joseph W. Fowler, George Pappas, and Dave Dineen.

Respectfully submitted,
NORMAN A. JOHNSON, *Secretary*

Dr. Peter Sammartino, President of Fairleigh Dickinson College and Herbert R. Mauersberger, Faculty Advisor of the College's New Student Chapter.

NOTICE TO LOCAL SECTIONS

All technical papers and reports of discussions should be sent to the Editor of the Proceedings:

DR. CARL Z. DRAVES
435 Hudson Street,
New York 14, N. Y.

ALL ADDRESS CHANGES SHOULD BE REPORTED IMMEDIATELY TO THE NATIONAL SECRETARY

GROUP PHOTOGRAPH TAKEN AT THE NORTHERN NEW ENGLAND SECTION'S SILVER-JUBILEE OUTING, JUNE 9, 1950, AT THE MERRIMACK VALLEY GOLF CLUB, METHUEN, MASSACHUSETTS

Northern New England Section Silver-Jubilee Outing

THIRTY-FOUR of the original 265 charter members who organized and founded the American Association of Textile Chemists and Colorists at the Engineers' Club in Boston on November 9, 1924, were honored at the all-day silver-jubilee outing at the Merrimack Valley Golf Club in Methuen, Mass. on Friday, June 9, 1950.

The highly successful and enjoyable event ended with dinner, introduction of guests at the head table and awarding of prizes.

Presentations were made to each AATCC charter member present by Frank J. O'Neil, Pacific Mills, chairman of the Northern New England Section, who cited "the bold spirit it took to start this organization," and paid tribute to "this small group of men whose efforts started a research program which today is so extensively recognized that it has gained financial support by industry amounting to many thousands of dollars."

One hundred and eleven of the original 265 members are living, and of these, 36 are in the Northern New England Section of the AATCC, which sponsored the get-together. Charter members present, most of whom were from the Northern New England Section, included the following: Edward S. Chapin, Durfee Co.; Hugh Christison, Arlington Mills; Alan A. Claflin, Consulting Chemist; Raymond B. Clogston, Retired; John N. Dalton, Pacific Mills; Walter C. Durfee, Durfee Co.; Frank E. Fleming, Goodall Worsted Co.; Frank W. Gainey, National Aniline; Harold E. Gile, Berkshire Color & Chemical; John H. Grady, Calco Chemical; Henry D. Grimes, American Woolen Co.; Arne Gyzander, National Aniline; Walter E. Hadley, Retired; Arthur Hirst, Standard Chemical Products; Frank C. Holden, Ludlow Manufacturing; Michael J. Lane, Geigy Co.; Harold W. Leitch, Pacific Mills; Frank McCool, Sandoz Co.; Arnold W. Midwood, DuPont Co.; Alex Morrison, American Woolen Co.; Carroll Peck, George Mann & Co.; Tom Peel, Pacific Mills; Walter F. Prescott, Prescott & Co.; Leverett N. Putnam, National Aniline; Joseph W. Russell, American Lanolin; Arthur H. Sampson, Calco Chemical; Albert E. Sampson, National Aniline; Frederick Spencer, Arlington Mills; George Stewart, Sandoz Co.; William Stoehrer, Pentucket Mills, Retired; Joseph E. Travers, United Aniline; Ben Verity, Carbic Color & Chemical; Warren H. Whitehill, Pacific Mills; P. J. Wood, Royce Chemical.

Albert E. Sampson, who is also a char-

ter member and who was general chairman of the NNE section's first outing 25 years ago, was general chairman of the outing committee, with Mr. O'Neil as chairman ex-officio. Mr. Sampson introduced the following head-table guests: Ralph E. Hale, vice-chairman of the section; Hugh Christison, first chairman of section; Harold W. Leitch, third chairman of section; Kenneth R. Fox, a national councilor representing the section, and Frank J. O'Neil, present chairman of the section; Leverett N. Putnam, sixth chairman of section; Henry D. Grimes, fifth chairman of section; Clarence Nutting, ninth chairman of section; John N. Dalton, tenth chairman of section; Edward S. Chapin, present chairman of the corporate membership committee and eleventh chairman of the section; P. J. Wood, third national president, and Michael J. Lane, a charter member.

Kenneth R. Fox, former president of Lowell Textile Institute, who recently resigned to join Burlington Mills in an executive post, was tendered a gift in recognition of his service to this area and to the Institute's growth. Responding to the presentation by Hyman P. Selya of Sagamore Color & Chemical Co., Mr. Fox expressed hope that the liaison between the Northern New England Section of AATCC and the Institute which developed during his association with the institute, and which was strongly supported by the present NNE sectional officers, would be continued.

Hugh Christison, chief chemist of Arlington Mills, received a special citation for outstanding service to the AATCC, presented by C. Wendall Lever, Goodall-Sanford, Inc. Special recognition was given to light-fastness standards, with which Mr. Christison has been identified.

Mr. Leitch engaged a professional movie operator to take action movies in color, with sound, of all charter members present. These shots will be worked into a pictorial record showing the birthplace of the organization, the Engineers' Club, Boston.

Michael J. Lane, charter member, led the community singing, with Frank Fitzpatrick at the organ.

Many prizes consisting of trophies and merchandise were distributed. Special prizes consisting of golf irons and woods were won by L. Billings, M. Harris, E. Chapin and W. Senecal.

Approximately 100 of the 262 present participated in the golf tournament. Winners in the respective divisions were as follows: *"A" Division*—A. Gard, Monsanto Chemical, low gross and A. Grant, Pacific Mills, low net; *"B" Division*—F. Dushame, retired, Wood Mills, low gross and M. Campbell, Pacific Mills, low net; *"C" Division*—H. Ortstein, low net; *Guest Division*—T. Davies, Ayer Mills, low gross and T. Trott, low net.

J. Young made the longest drive. B. Batcheller and A. Greenfield were second and third, respectively. W. Caffrey won the putting contest, followed by Silloway, Brandy and Wieland.

A five inning softball game was won by J. Murphy's team, which consisted of Messrs. Glecklen, Wood, Rivers, Collins, Ritter, Carroll, Walz, Lyle and Murphy. J. Magrum was the umpire.

Horseshoes and cards were also enjoyed.

Assisting Messrs. Sampson and O'Neil with arrangements were the following: *general committee,* Stephen W. Bastow, Alan A. Claflin, Roland E. Derby, Thomas W. Shoesmith; *dining,* Edward B. Bell, William F. Piekarski; *finance,* Walter H. Zillessen, George O. Linberg, Hyman P. Selya; *general sports,* Joseph E. Travers; *golf,* Alfred T. Grant, Lyman Billings and Herbert E. Wieland; *music,* Michael J. Lane, John N. Dalton; *parking,* Howard L. Jenkins, Hugh Christison; *publicity,* Frederic A. Prisley; *prizes,* Richard G. Robertson, Daniel J. Ardito, Paul G. Robbins; *program,* Azel W. Mack, John F. Sheehy; *cards and cribbage,* Harley Glidden; *putting,* Harry Buckley, Henry T. Rooney; *special events,* Harold W. Leitch, Edward S. Chapin and Harry M. Hartnett.

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Charlotte Observer Lauds AATCC Work

THE following editorial appeared in the July 4th issue of the Charlotte, N. C., Observer:

"While much energy is being expended in destructive pursuits, solid satisfaction inheres in contemplation of the record of the American Association of Textile Chemists and Colorists in advancement of constructive objectives.

"Equipped with know-how concepts and processes, possessed of technical skills of a very high order of efficiency and constantly striving for further modernization in the textile industry, members of the association for a number of years have worked tirelessly and effectively for important improvements and at the same time for preservation of dependable standards in safety and other spheres.

"Among the units of the association, an outstanding record has been achieved by the Piedmont section. It is to be heartily congratulated for the large contribution which it is making along these purposeful and worthy lines. As the center of much of its program, Charlotte has an abidingly friendly interest in its continued career of broadly and intensively expanding usefulness. It is a decidedly vital factor in much progress which is being attained in its field of endeavor."

Southern Section Fall Meeting to Feature Symposium on Detergency

THE Southeastern Section will hold its Fall meeting in LaGrange, Georgia on Saturday, September 23. Beginning in the afternoon, the technical and business session will be held in the Callaway Auditorium. The Technical Session will feature a symposium on Detergency. A number of operators and suppliers have been invited to sit in on the panel.

The banquet will be held in the Callaway Auditorium and will be followed by an after-dinner program by Larry Livingston of duPont.

CALENDAR

COUNCIL

Meetings: Sept. 28-30 (Portsmouth, N. H. Convention) Nov. 17 (New York).

NATIONAL CONVENTIONS

1950: September 28 to 30, Portsmouth, N. H
1951: October 18 to 20, Statler, New York
1952: Boston.

HUDSON-MOHAWK SECTION

Meetings: Sept. 15 (Albany), Oct. 20 (Utica), Dec. 8 (Albany), Jan. 19, 1951 (Albany), Mar. 16, 1951 (Albany), May 11, 1951 (Albany), June 22, 1951 (Annual Outing).

MID-WEST SECTION

Meeting: October 28 (Chicago, Ill.).

NEW YORK SECTION

Meetings: October 30 (Swiss Chalet, Rochelle Park, N. J.), November 17 (Swiss Chalet), Jan. 12, 1951 (Hotel New Yorker), Feb. 23, 1951 (Hotel New Yorker), March 30, 1951 (Swiss Chalet), May 4, 1951 (Swiss Chalet), June 15, 1951 (Outing).

PHILADELPHIA SECTION

Meetings: October 28 (Meeting-in-Miniature, Philadelphia Textile Institute), December 8, January 17, 1951.

PIEDMONT SECTION

Meeting: October 28 (Charlotte, N. C.)

RESEARCH COMMITTEE

Meetings: Sept. (Portsmouth, N. H., Convention), Nov. 17 (New York).

RHODE ISLAND SECTION

Meetings: October 27 (Providence Engineering Society Hall), November 17 (Johnson's Commodore Room).

SOUTH CENTRAL SECTION

Meetings: August 18-19 (Summer Outing—Read House—Hotel Patten, Chattanooga Country Club—Chattanooga, Tenn.), Nov. 4 (Hotel Patten, Chattanooga, Tenn.).

SOUTHEASTERN SECTION

Meetings: September 23 (LaGrange, Ga.), December 9 (Atlanta, Ga.).

Photo by Kenneth C. Everett

Rhode Island Section Members Examine Cuban Textile Supplies

L. to R.—George H. Wood, 1950 AATCC Convention Chairman; Robert W. Joerger, Chemist, Franklin Process Co.; Elliot Broadbent, Chairman, Rhode Island Section; and Ira S. Hurd, Warwick Chemical Co., Speaker at the May meeting of the Rhode Island Section.

Hurd Gives Impressions of Cuban Textile Industry Before R. I. Section

IRA S. HURD was the speaker at the May meeting of the R. I. Section held May 26th at Johnson's Commodore Room, Providence, R. I. His subject was "Impressions of the Textile Industry in Cuba."

Mr. Hurd supplemented his talk with colored movies (which he took himself) and a display of Cuban textile samples. He aimed at getting his audience into the spirit of things by wearing a Cuban-made suit and tie.

A close-up of David O. Hamor, Jr. (left) and Leslie L. Walmsley. See caption below.

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information from the Secretary.

50-18

Education: B.S. in Chemistry from Brooklyn College; and in Textile Chemistry & Dyeing from Bradford Durfee Technical Institute.
Experience: Asst. Dyer and Chemist.
Age 26; married; references.

7-10, 7-24

50-19

Education: B.S. with graduate work in chemistry.
Experience: Chief chemist, dyes and intermediates.
Age 47; married, references; geographical location not essential.

7-10, 7-24

50-20

Education: Textile school, chemistry and dyeing.
Experience: Chemist and dyer.
Age 31; married; references; vicinity of New York City preferred.

7-24, 8-7

50-21

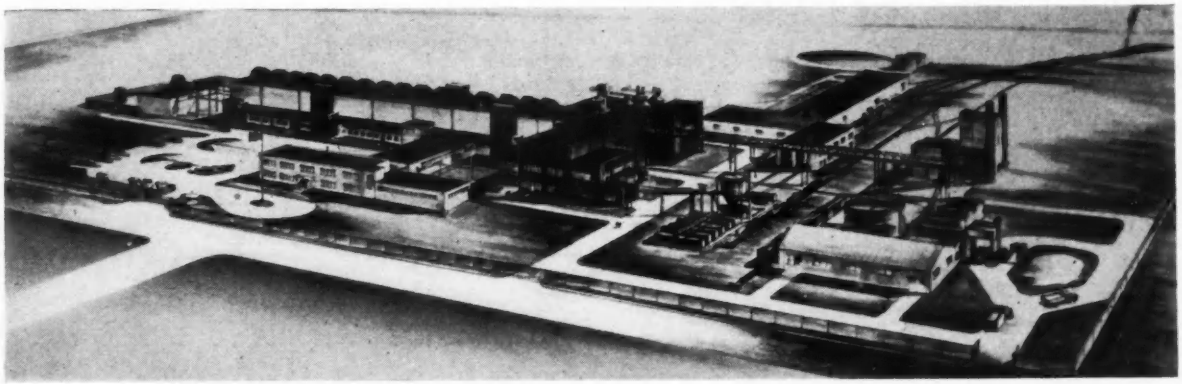
Education: Textile technology. Utica Technical Institute.
Experience: two months summer employment in textile mill.
Age 20; references; New York and New England preferred.

7-24, 8-7

Head Table at the May Meeting of the Hudson-Mohawk Section Held at the General Aniline Works in Rensselaer N. Y.

L. to R.—Albert E. Herrmann, Jr., General Aniline Works; William A. Nelson, Ritter Chemical Co.; David O. Hamor, Jr., Arkansas Co., Inc., Section Chairman; Leslie L. Walmsley, American Viscose Corp., who spoke on the subject of a new machine for presetting tricot knit goods; Jackson A. Woodruff, American Viscose Corp.; John J. Hanlon, Mohawk Carpet Mills, Inc.; and Irwin J. Smith of the Surpass Chemical Co., Inc.

TRADE NOTES • NEW PRODUCTS



New $10,000,000 Sodium and Chlorine Plant of National Distillers Chemical Corp. at Ashtabula, Ohio.

• National Distillers Starts Commercial Operations

National Distillers Chemical Corporation Corporation has begun commercial operations at its new plant in Ashtabula, Ohio. The corporation is reported to have made its first commercial shipment of metallic sodium on June 20, and is also delivering chlorine to the adjacent plant of Hooker Detrex Inc. The chemical corporation is a wholly-owned subsidiary of National Distillers Products Corporation.

• British Wartime Research Reports

Hitherto unpublished results of wartime research in British government laboratories are now being disclosed through a series of selected volumes prepared by the British Ministry of Supply and Board of Trade and available to the American public.

According to the foreword to the series, the large quantity of research data accumulated for the war effort has been sifted with the object of "publishing those reports which are considered to be of primary interest to industry or of value to research scientists".

Volume 4, "Textiles and their Testing" deals with tearing strength of plied fabrics; measurement of peeling force of multi-ply textile fabrics; stress-strain relations in nonisotropic sheet material under two-dimensional stress; time effects in stressed fabrics; metal-plated fabric substitute for wire gauze; fireproof and gasoline-proof fabrics and garments; quantitative assessment of microbiological degradation of cotton; and process specifications for rot-proofing of textiles. The volume is now available; price: $1.40.

Orders for the above reports should be directed to British Information Services, 30 Rockefeller Plaza, New York 20, New York.

• Fielden Moves to Philadelphia

Fielden Electronics, Inc., manufacturers of indicating, recording and controlling instruments for moisture content, relative humidity, liquid level and the like, have occupied their new office and factory at 2920 North 4th St., Philadelphia 33, Pa.

Their offices were formerly at Huntington Station, N. Y.

• Atlas General Bulletin

The Atlas Mineral Products Co. has announced the publication of their new General Bulletin MCC No. 1 briefly describing Atlas' complete line of chemical construction materials, including: corrosion-proof linings, corrosion-proof cements, acid-proof brick and tile, corrosion-proof brick sheathings, corrosion-proof protective coatings and corrosion-proof floors. It also includes estimating data. Write to 42 Walnut Street, Mertztown, Pa.

• Scholler Elected PTIF President

Fred C. Scholler, President, Scholler Brothers, Inc., Philadelphia, Pa., was elected President of The Philadelphia Textile Institute Foundation at the Annual Meeting held recently at School House Lane and Henry Avenue, Germantown.

Mr. Scholler succeeds Colonel Millard D. Brown, who was President of the Foundation since its incorporation in 1944.

Theodore B. Hayward of Swift and Company, Philadelphia, Pa., was reelected First Vice President, while Everett L. Kent, President, Kent Manufacturing Company, Clifton Heights, Pa., was elected Second Vice President.

Stuart H. Carroll, the present Executive Secretary, was elected Treasurer, while Russell C. Osborne of Rider-Osborne-Devine, Inc., Philadelphia, Pa., was re-elected Secretary.

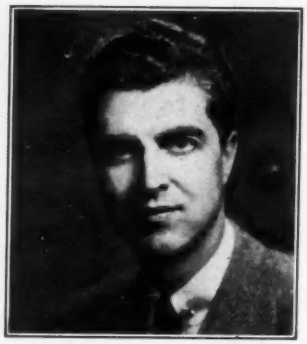
• Dr. McCauliff Wins Chemist Club Golf Championship

The Golf Championship of the Chemists Club, New York, was won by ex-tennis star Dr. Eugene McCauliff at the annual outing of the Club at Bonnie Briar Country Club, Larchmont, N. Y., on June 27th. Dr. McCauliff, now in charge of Sales and Special Projects for Glyco Products Company, shot 77 over the narrow, wood bordered fairways to annex the prize. He has held some of the top United States tennis titles, including the National Clay Courts Doubles Championships and the National Indoor Doubles Championships (twice), as well as the Eastern Inter-Collegiate title in singles and doubles.

• Whittelsey to Head Atlantic's Southern Sales

The Atlantic Chemical Corporation, Passaic, New Jersey, has announced the appointment of Laurie E. Whittelsey of Macon, Georgia, as Southern representative for the company.

Mr. Whittelsey will be in charge of southern sales for the complete line of Atlantic stabilized azoics in powder, solution and double solution form, direct and direct fast to light colors and the entire line of Atlantic vat dyes.



Martin J. Lydon

• Lydon Appointed to Lowell Textile Institute Presidency

Martin J. Lydon of 28 Ruth Street, Lowell, Mass., has been appointed to the office of President of Lowell Textile Institute by the Board of Trustees. The appointment was made at a Board Meeting held June 15, 1950. He succeeds Kenneth R. Fox, who recently resigned to accept an executive position with Burlington Mills.

Mr. Lydon, who moves up from his posts of Professor and Dean of Students at Lowell, is a graduate of Keith Academy, Harvard College and Harvard Graduate School of Education. Upon his graduation from Harvard College he took a position as Instructor in English at Howe High School, Billerica, Mass., while completing requirements for his master's degree in Education. After a year with the Lowell Textile Institute faculty he was named Dean of Men at Palm Beach (Fla.) Junior College in 1946. He retained that post until 1948 when he returned to LTI.

Aside from his experience in education, Mr. Lydon has had extensive business experience. As a native of Lowell, and a member of various social and civic organizations, he has important local connections and familiarity with economic and other situations in the Merrimack Valley area. Further, several years experience working with Mr. Fox have afforded him an insight into problems peculiar to Lowell Textile Institute, and to the industry in general.

In a statement by Mr. Lydon, it is revealed that his primary concerns are centered about personal development of the individual student, a broadened curricular base and physical plant and facilities. Mr. Lydon's statement follows.

"The successor to Kenneth R. Fox as President of Lowell Textile Institute should, in my opinion, be concerned primarily with the following:

(1) *Personal development of the individual student.* Since the Institute is dedicated to the preparation of young people for positions of responsibility in the textile and allied industries, it must encourage in them attitudes of diligence, punctuality, fairness, tolerance, loyalty, and that confidence and faith in themselves and others which assures individual and social progress. In determining professional competence, moral character is at least equal in importance to technical knowledge and skills. Thus it becomes mandatory that the Institute, in addition to teaching the very best vocational information and techniques, must continue to emphasize the personal development of the individual student so that he may discharge his personal, industrial, and social obligations in an intelligent and creditable manner.

(2) *Broadened curricular base.* There is a present need for the refinement of current courses and the addition of new ones in the fields of basic theoretical science, and textile, paper, and leather technology; moreover, in the near future, conditions might well justify the initiation of additional areas of specialization, such as plastics. These purely technical courses should immediately be supplemented by the introduction of material from such liberal arts fields as psychology, sociology, economics, and English. Such seemingly abstract factors as the ability to get along well with all types of people, or the knack of meeting problem situations with dispatch and efficiency, or the art of expressing one's thoughts effectively in speech or in writing, are fundamental requisites for the student who wants to exploit to the full his lecture and laboratory training. In this connection, it is essential that there be developed a very thorough and complete integration and co-operation between industry and the Institute, in the form of conferences, convocations, apprenticeship and employment programs, in-service and adult education, and similar joint projects which can give to the student adequate opportunities to apply their classroom learning to practical, real-life situations.

(3) *Physical plant and facilities.* The preeminence of the Institute can be ensured in large part by the vigorous prosecution of the presently-planned construction program—which has been carefully calculated to effect an optimum balance in the student-faculty-facilities relationship. Lack of physical space and equipment still presents problems which must be vigorously attacked by the President of the Institute, who must be alive also to the possibilities of developing facilities in new fields of endeavor (such as plastics) if such innovations seem in the best economic interest of the Commonwealth. The very best and most modern equipment and plant should be available so that students and faculty in all departments of the Institute shall have every opportunity to pursue an intensified program of investigation and research, in addition to the regularly scheduled class work. The acceleration of technological change in the textile and allied fields makes it imperative that the students of Lowell Textile Institute be properly trained in the development and use of those tools which will construct a favorable future for industrial New England."

• Glassware Marker

A tungsten carbide pencil for permanently marking glassware is now available from the Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa. Only slightly below the diamond on the hardness scale, tungsten carbide is cheaper than the diamond and comes to a definite point rather than an edge as is found on a diamond tip. The new pencil is said to be useful for a variety of laboratory tasks.

The tungsten carbide point is permanently mounted in a knurled steel pencil shaft and is protected by a cap so the pencil may be safely carried in the pocket.

• New QMC Woolen Treatment Combats Moths

Large savings through more effective protection of Army woolen fabrics and uniforms against damage by moths and other insects is expected to result through application of a new insecticide treatment by the Quartermaster Corps, it has been announced by the Department of Defense.

As a result of tests extending over the past three years, the Quartermaster Corps has adopted a method of treating woolen fabrics with a solution of DDT at the time the materials are sponged. These tests show that woolen goods treated with a solution of one-half of one per cent DDT are protected from insect damage throughout an indefinite period of storage, and that the materials continue to be insect-proof after they have been made into uniforms until the uniforms are dry cleaned. The protection may then be extended by again treating the uniforms during subsequent dry cleaning or laundering.

Based upon current procurement and storage of woolen materials, savings of from $75,000 to $100,000 a year are expected in the cost of insecticide treatment, it is stated. Not calculated is the saving from losses incurred by damage caused by fabric insects nor other savings expected from simplified methods of storage and handling.

The present method of protecting wool fabrics in storage against insect damage consists of placing naphthalene flakes in rolls of cloth and in boxes of manufactured uniforms; atmospheric fumigation with methyl bromide; application of residual sprays on the outside surfaces of stacks and in storage environs; and the frequent aerosol treatment of warehouses.

During the past 2½ years, several stacks of wool fabrics were stored in the Depart-

ment of Agriculture laboratory at Savannah, Georgia, under conditions simulating warehouse storage and with a heavy concentration of insect infestation, it is reported. Some samples were untreated, while others were treated with different kinds of insect repellents and insecticides. A total of 47 so-called mothproofing agents are reported to have been tested in the Quartermaster Research and Development Laboratory at Philadelphia, Pa.

At the end of the test period, Quartermaster and U. S. Department of Agriculture observers are said to have found that woolen fabrics treated with .5 per cent solution of DDT were completely protected. Not even the nap had been consumed. The untreated samples reportedly suffered various degrees of damage from light to extreme. Insects used in the test were larvae of the black carpet and furniture beetle and the clothes moths.

Application of the DDT solution is expected to cost about .4 cents per lineal yard in addition to the cost of sponging, it is stated. So as to fully protect personnel engaged in the operation from breathing solvent fumes, some modifications to existing sponging machinery and plant are required.

Wool already in storage will be protected by spraying a 5 per cent solution of DDT (1 gallon to 1000 square feet of surface at 12-months intervals) around the exposed surfaces of each stack, it is stated, and all newly manufactured wool cloth will be treated with the .5 per cent solution of DDT at the time of sponging. Woolen materials in storage will receive the same treatment as rapidly as it can be processed.

The prolonged tests are said to have shown that the DDT treatment is resistant to weathering and pressing; it does not damage the material or color; and the Office of The Surgeon General has advised that it will not affect the skin or health of personnel wearing uniforms made from treated materials. All DDT conforming to Grade 3, in joint Army-Navy specification JAN-D-56 is said to be satisfactory for the process. It can be applied either in the laundering process or the dry cleaning process.

• Price Decrease in Emery Product

Emery Industries, Carew Tower, Cincinnati 2, Ohio, has announced the price decrease of Emersol 132 Lily Stearic Acid, a premium quality stearic acid, to the level of regular triple-pressed stearic acids represented by Emersol 130 Lily Stearic Acid. The company claims the following extra features in Emersol 132 at no extra cost: high quality (1.0 max. iodine value), resistance to oxidation, best initial color and odor, stability of color and odor, resistance to rancidity, constant composition and uniform high quality.

The production of Emersol 130 Lily Stearic Acid will be continued.

• "Colorimetry"

A new booklet, on color measurement, *Colorimetry,* recently published by the National Bureau of Standards is now available from the U. S. Government Printing Office.

The booklet describes the standards and measurement methods developed by the Bureau in this field, giving the basis for each technique and showing how one method supplements the other. Chapters cover the following topics: the standard observer; illuminants and coordinate system; small-difference colorimetry; material standards of color; one-dimensional color scales; and general methods.

Circular C478, Colorimetry, by Deane B. Judd, 56 large double-column pages, illustrated, 30 cents a copy, is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Remittances from foreign countries must be in United States exchange and must include an additional sum of one-third the publication price to cover mailing costs.

• Trotter Appointed Southern Branch Manager

Monsanto Chemical Company has announced the appointment of John B. Trotter as general branch manager of its southern sales district, with headquarters at Birmingham, Ala.

A native of Birmingham, Mr. Trotter has been associated with the chemical industry since 1927. He has served as assistant branch manager in charge of the company's Charlotte, N. C. office and as assistant general branch manager at the Birmingham office.

Mr. Trotter is a member of the A.A.T.C.C. and the American Chemical Society.

• New ARC Chicago Office

The Midwestern Offices of the Atlantic Refining Company Chemical Products Section are now located at 332 South Michigan Avenue, Chicago 4, Illinois. Their telephone is Wabash 2-2552.

• Mothproofing Pioneers Move

Daniel H. Jones Laboratories, Inc., a long established firm in the mothproofing field, has moved to expanded facilities at 222 Liberty Street, Camden 4, N. J.

Edmund R. Roper

• Dexter Chemical Appoints Roper

Dexter Chemical Corp. has announced that they have expanded operations in their Southern Division, by appointing Edmund R. Roper to their organization in the North Carolina-Virginia area. Mr. Roper has been associated for the past ten years with Pacific Mills' Lyman Division as a Research Chemist. During the past five years he specialized in product development, including resin applications and special finishes.

Mr. Roper will make his headquarters in Greensboro and operate under the direction of Leonard Slesinger, Southern Division manager for Dexter Chemical Corp.

• New Line of Durofast Colors

Berkshire Aniline Works, Inc., Newark, N. J., has announced a new line of direct colors reported to be of outstanding fastness to washing, light and perspiration, and suitable for after-treatments with resin. These colors have also shown exceptional adaptability for the new Copper-resin after-treatments, it is stated.

Colors now in the series are:

Durofast Yellow 2GLL, Durofast Yellow RLSW, Durofast Orange 2GLL, Durofast Red Brown 5RLL, Durofast Brown BRL, Durofast Dark Brown BGL, Durofast Red 6BLL, Durofast Red 7BLN, Durofast Rubine 3BLL, Durofast Bordeaux BLL, Durofast Brill. Blue 6BLL, Durofast Blue 3GLL, Durofast Blue 7RLL, Durofast Blue LBLL, Durofast Grey 2BLL, Durofast Black 0TB.

A color card illustrating these shades and the effect of resin on these shades has been prepared with listing of fastness properties before and after resin treatments.

Samples of the Durofast colors and a copy of the new shade card can be obtained by writing, on a company letterhead, to the sole selling agents for these colors: Berkshire Color & Chemical Corp., Pine & Cherry Streets, Delawanna, N. J.

• New Ciba Items

Ciba Company, Inc., 627 Greenwich St., New York 14, N. Y., recently brought out a number of new items. Manufacturer's descriptions of the products follow:

Chlorantine Fast Yellow 2GLL—A new addition to the Chlorantine Fast color series that should be of unusual interest for all textile fabrics where extreme light fastness is desired. Its light fastness may best be described as reaching the level of the best yellows of the vat color range. Dyeings of this color may be finished with urea formaldehyde resin without any loss in light fastness. Acetate and nylon effects are reserved white. It is not suitable for discharge.

Chlorantine Fast Bordeaux RCW—Another new Chlorantine Fast color noteworthy for its clear bright shade, good light fastness and excellent dischargeability. It has good solubility, levels well, reserves acetate rayon and is practically unchanged by acid or alkali spotting.

Cloth Fast Bordeaux B—A new addition to the Cloth Fast series that produces bluish shades of red of outstanding light fastness. It exhausts from a neutral bath and is especially adaptable to the dyeing of wool in blended fabrics requiring good light fastness. Chroming has no appreciable effect on the shade and it should provide an excellent shading color in Chrome piece goods dyeing. The presence of iron or copper in the dye bath has no appreciable effect.

Coprantine Bordeaux 2BLL Conc.—A new bordeaux of the Coprantine series that produces a bluish shade of red with combined wash, light and perspiration fastness. It has very good solubility and may be applied to cotton and viscose rayon in all stages of manufacture. It is highly recommended for package dyeing on any type of pressure machine.

Cibacete Brilliant Pink 4BN—A new highly dispersible acetate dyestuff for brilliant cerise shades. It is recommended not only for the dyeing of extremely bright pinks but also for application printing because of its excellent dispersibility and resistance to sublimation in the aging process.

Cibacete Diazo Black 3GC—A new very jet shade of developed black for acetate rayon. Like Cibacete Diazo Black PS New it combines solubility and dispersion with low temperature dyeing and excellent penetration of the tightest woven fabrics.

Neonyl Black CW—A new acid black for nylon that offers the advantage of easy application together with good perspiration and water fastness. It is applied from a neutral dye bath and can be combined with direct blacks to produce excellent unions on mixtures of nylon and cotton such as cotton hosiery with nylon toe and heel.

240A "Karbate" Heat Exchanger

• New Heat Exchangers Catalog

A new Catalog Section (M-8801.1) has been issued by National Carbon Division, Union Carbide and Carbon Corporation, 30 E. 42nd St., New York, N. Y., containing specifications, sectional dimension drawings and ordering information for the new Series 240A "Karbate" Brand Impervious Graphite shell-and-tube heat exchangers.

The new, larger, standard 240A heat exchangers, similar in construction to the Series 70A and providing 71 sq. ft. of heat exchange surface, are said to possess chemical resistance to practically all corrosive fluids, resistance to severe thermal shock and high heat transfer rates. Single, double or four pass routing of the tube side fluid is reportedly effected by a change of fixed and floating and cover assemblies. Oversize shell side connections contribute to the flexibility of the new unit which may be operated in either a vertical or a horizontal position, it is stated. The maximum hydrostatic operating pressure recommended by the manufacturer is 75 psi., maximum steam pressure 50 psi., and working temperature 338 deg. F. Replacement of tubes can be done in the field.

• PTIC Elects Officers

At the first annual meeting of the membership of the Philadelphia Textile Institute Corporation held June 20th at School House Lane and Henry Avenue, Germantown, Theodore B. Hayward of Swift and Company, Philadelphia, Pa., and Rinaldo A. Lukens of Continental Mills, Inc., Philadelphia, Pa., were elected Chairman of the Board and President of the Corporation, respectively.

Other officers to be elected at this time include: Fred C. Scholler, Scholler Brothers, Inc., Philadelphia, Pa., First Vice President; Benjamin Gibbs, Gibbs Underwear Company, Philadelphia, Pa., Second Vice President; Julius Zieget, Secretary and Treasurer; Anthony J. Haldis, Assistant Treasurer and Thomas Hyndman, Solicitor.

Bertrand W. Hayward and Richard S. Cox were reappointed Director and Dean of the Institute, respectively.

New members of the Board of Trustees elected at this time were:—Dr. C. Scott Althouse, Althouse Chemical Company, Reading, Pa.; Henry H. Benedict, Henry H. Benedict Company, Camden, N. J., Morris R. Brownell, Jr., Philadelphia National Bank, Philadelphia, Pa.; Frederic C. Garman, President, Philadelphia City Council; Harold H. Hart, Wolfeboro, New Hampshire; R. Max Ott, Richard M. Ott Sons, Boston, Mass., and H. Wickliffe Rose, American Viscose Corporation, Philadelphia, Pa.

• Smith-New York Chemicals Catalogue

A catalog of their chemicals available for shipment by first class mail has been released by Smith New York Co., Inc., Research Laboratories, Freeport, N. Y. A description of the service is given in the folder, available on request.

• Marshall Announces New Felt Association Committees

Following his recent election to the presidency of The Felt Association, Jule F. Marshall, vice-president of American Felt Company, has announced several new committees and outlined a number of planned activities for the association.

A committee of manufacturer members has been set up with three divisions—(A) representing flat felt manufacturers; (B) makers of sheet felt and felt wheels, and (C) applying to jobbers and cutters.

Group A will have as its function consideration of the problems of raw stock supplies and inventories, the interchange of information as to machinery for the purpose of developing increased efficiency in manufacture, union relations, and the development of a monthly statistical reporting system of production and shipments and certain other activities. W. C. King of The Felters Co. is chairman, the other committee members being J. T. Lawless, American Felt Co., John S. Murray and Lyndon S. Rosenau, Standard Felt Co., and L. H. Hansel, Felters.

Group B includes S. N. McNeilly, Bacon Felt Co., *chairman;* Ernest Johnson,

American Felt Co. and A. N. Sudduth, James H. Rhodes & Co. Group C includes C. A. Hubner, Central Felt Co., *chairman;* E. P. Travis, Continental Felt Co. and C. K. Hassett, Supreme Industrial Products Co. These two groups will function, respectively, as "A" group does in its field.

An economics and legislation committee has been formed to conduct research into all subjects of an economic and legislative nature which might affect the pressed wool felt industry. This Economics Committee is headed by H. F. Roche, American Felt Co.

William H. Lehmberg, American Felt Co. is chairman of the Standards and Marketing Committee, which will have the responsibility of development of standards work. On the marketing side will be the exploration of marketing problems and simplification work predicated in the results of this research. On this committee are E. P. Travis, Continental; Herman G. Berglund, Standard Felt Co., S. N. McNeilly; L. H. Hansel, Ray R. Stevens, Felters, and H. Warner Dailey, *secretary.*

Other committees include: nominating committee, L. H. Hansel, *chairman;* publicity committee, R. V. Dwyer, Felters, *chairman;* entertainment committee, C. A. Hubner, *chairman.*

• Cuprophenyl Yellow RL Extra

Further development of Geigy's "Cuprophenyl" series has been made with the release of Cuprophenyl Yellow RL Extra, the first yellow in this group of colors.

The "Cuprophenyl" designation was chosen by Geigy for a new range of Direct dyestuffs possessing good resistance to washing, water bleeding, salt water, dry cleaning, wet cleaning, as well as light, when aftertreated with copper sulfate and acetic acid.

Cuprophenyl Yellow RL Extra is applied in the usual manner recommended by the company for Cuprophenyl colors, and has the same good fastness properties characteristic of the group, it is stated. The shade of Cuprophenyl Yellow RL Extra reportedly is not materially affected by anticrease finish.

When aftertreated with Geigy's G-100, the wash fastness is still further improved over the conventional aftertreatment of copper sulfate and acetic acid, the company states. It is further stated that the light fastness is unaffected, and the shade is but slightly duller.

Bulletins covering Cuprophenyl Yellow RL Extra are presently being prepared. Interested parties may be placed on the company's mailing list for a copy immediately on release, by writing to Geigy Company, Inc., 89-91 Barclay St., New York 8, N. Y.

Stokolite L-44 Dipper

• New Dipper Improves Safety Factor

A greatly increased safety factor in handling corrosive liquids is reported possible by a new type dipper (the Stokolite L-44) for use with a wide variety of chemicals, according to the manufacturer, Stokes Molded Products, Inc., Trenton, 4, N. J. The Stokolite L-44 dipper is being introduced as a companion to the Stokolite pail which the company put on the market last fall.

Made of Stokolite L-44 compound, which has a base of virgin rubber, the new dipper is reported to be streamlined for lightness with an efficient pouring lip and a well reinforced handle. The nature of the material is said to give it unusually high resistance to shock, abrasion, heat, and chemical corrosion and to render it practically indestructible.

The dipper is made in one-quart and two-quart sizes. Additional information may be obtained by writing to the manufacturer.

• Calco Advertising Gets Top Award

The ad series "Calco Dyelines," running currently in trade publications to the textile industries, recently received the Premier Award for Business Paper Campaign, Product Advertising in Industrial Publications.

The entry was submitted by Calco's agency, Hazard Advertising Company, in the Annual Creative Awards Competition of the National Advertising Agency Network. The award was presented at the 19th Annual Conference of this association, held at the Seigniory Club, Montebello, Quebec.

There were over 275 entries by concerns of national prominence. The panel of judges selected to judge this year's entries were authorities in the fields of advertising, market research and sales promotion.

"Calco Dyelines" was adopted two years ago by Calco after careful study of sales problems, markets and products sold by the Company to the market. After the series had appeared eight months, an opinion survey was conducted by the Advertising Department. Questionnaires were mailed to the entire textile industry comprising a mailing list of about 3500 names.

The returns amounted to 37 per cent, which is high and indicated that the service was proving very effective as a medium for promoting the sale of Calco dyestuffs.

"Receiving the number one award in this national contest of more than 275 entries," E. K. Hunt, Calco Advertising Manager, stated, "confirms the effectiveness of the approach adopted for this ad series."

• Dr. Abrams Heads SRI Textile Section

Appointment of Dr. Edward Abrams, nationally known textile research scientist, as head of the Textile Section of the Southern Research Institute has been announced by Director William M. Murray, Jr.

Under the direction of Dr. Abrams, the Institute plans immediate inauguration of an expanded and diversified service program to the textile industry, Dr. Murray said.

Dr. Abrams served from 1941 to 1946 as head of the Microbiology and Microscopy Laboratories of the National Bureau of Standards in Washington, D. C., and was subsequently head of the Biology Division of the Institute of Textile Technology in Charlottsville, Va. He has practiced recently as a textile consultant in New York City.

Dr. Abrams has specialized in many fields of textile research, including the development of fire and mildew resistant fabric and water repellent textile materials. He has also engaged in extensive research directed toward elimination of stream pollution by all types of mills. During his association with the National Bureau of Standards, Dr. Abrams and his staff developed new mildew resistant finishes for tent and sandbag fabrics used by the armed forces in the South Pacific.

During World War II more than 500 million yards of sandbag fabric wer eapproved by Dr. Abrams' laboratory. Dr. Abrams is the author of numerous publications in the field of textile research and a member of many scientific societies, including the American Association of Textile Chemists and Colorists; Society of Industrial Microbiologists; American Chemical Society; American Association for the Advancement of Science and the honorary Sigma Xi Society.

Dr. Paul Burchfield, left, and Charles S. Johnson

• Burchfield Heads Wyandotte Technical Service

Dr. Paul E. Burchfield has been appointed director of technical service, Wyandotte Chemicals Corporation, Michigan Alkali Division, Bert Cremers, vice president, has announced.

Dr. Burchfield succeeds Charles S. Johnson who has been director of technical service since 1939. Mr. Johnson is retiring from active service, but will serve Wyandotte Chemicals in an advisory capacity.

After completing his formal education, Dr. Burchfield joined the Harshaw Chemical Company in 1934 as a research chemist. In 1938, Dr. Burchfield worked with the United Gas Improvement Company as a research chemical engineer, specializing in plastics and rubber. Joining Wyandotte Chemicals Corporation in 1943, he spent three years as assistant supervisor in the chemical engineering department, research division, and was appointed assistant director of technical service department in 1946. Since then he has established himself in all the industries served by Wyandotte.

Dr. Burchfield, in his new capacity, will continue his many active contacts with the chemical industry in the field of technical service.

Mr. Johnson has been affiliated with the name Wyandotte most of his life. Born in Wyandotte, Mich., where he obtained his elementary education, he attended the University of Michigan, working every other year at Wyandotte Chemicals. He was graduated in June, 1911. At this date, he had already gained experience in the company's cooperage and the product analysis laboratories. After graduation, he was promoted to the main laboratory to work on special assignments, divided between the development of new chemical processes or products, to trouble-shooting for Wyandotte customers—his initiation into technical service activity.

• Price Drop On Surfactants

A cut of thirteen to fifteen per cent in the prices of nonionic surfactants was recently announced by Antara Products, General Aniline & Film Corporation.

Antara's surfactants in the nonionic class are glycols and glycol esters of the polyoxy-ethylene series, both alkyl and alkylaryl. They range from light clear liquids through pastes to waxes. All are included in the reduction which is expected to increase their use in heavy-duty industrial cleansers, in the compounding of soaps and as emulsifiers for consumer goods.

• Du Pont Evaluating Fiber V

The Du Pont Company, Wilmington 98, Del., is evaluating a new synthetic textile fiber on an experimental scale. Limited quantities of window curtains, blouses, sport shirts, sewing thread, and summer suitings made from this new product, known tentatively as Fiber V, are currently being tested to determine the commercial possibilities of the new fiber in consumer products.

Technically, the material is reported to be a condensation polymer obtained from ethylene glycol and terephthalic acid. It is not chemically related to nylon. Quantities of both continuous filament yarn and staple required for development work are being made in an experimental operation at the Seaford, Del., plant of the Nylon Division.

Like nylon and "Orlon" acrylic fiber, Fiber V appears to offer many properties which the company states are potentially outstanding contributions to the textile industry. It is reported to have high tensile strength and high resistance to stretching —both wet and dry. It has good resistance to degradation by chemical bleaches and to abrasion, it is stated, and most of the fiber's properties are equally good under wet or dry conditions. Fabrics made from Fiber V have excellent resilience and resistance to wrinkling, launder easily, dry quickly, and can be heat set, it is stated.

A wide range of filament deniers is reported possible. The fiber has good electrical insulation properties and is not weakened by fungus, mold or mildew, the company states.

The fiber first was developed in England where it bears the trade-mark "Terylene." United States rights to manufacture the patented fiber were acquired by Du Pont Company in 1946. Extensive development work by Du Pont, since this acquisition, has been on a purely experimental basis and no decision has yet been made to produce the fiber commercially.

• New Chrome Colors

Two new chrome colors of special interest to woolen and worsted manufacturers have been added to the textile dyestuffs line of the Hilton-Davis Chemical Company Division of Sterling Drug Inc. They are being marketed as Hidachrome Orange G Concentrated (C.I. 40) and Hidachrome Yellow 2-G Concentrated (C.I. 36).

• Monobed Deionization Booklet

A 12-page illustrated booklet on "Amberlite Monobed Deionization" by Resinous Products Division, Rohm & Haas Company, Washington Square, Philadelphia 5. Pa., offers a form on the history, behavior, present performance and potential uses of the Monobed ion exchange systems in the water-conditioning, chemical process and other industries.

Reactions of the various combinations of exchangers are explained in text and equations. The booklet discusses operating costs, equipment costs, quality of product derived, rinse requirements and other properties as they apply to the complete or partial single-step removal of ionized solids from solution. A section is devoted to design and operation of Monobed equipment, and more than 80 fields of possible applications are listed. A table shows nomenclature, chemical behavior and typical uses of each of the six systems thus far developed and evaluated. The booklet is available on request.

GS No. 17 Pump

• Air Line Pressure Pumps

Safe and convenient transfer of acids and other liquids from stainless steel containers is now reported possible with the GS No. 17 pump, a product of General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa. Liquids flow smoothly, stop instantly and come in contact only with the corrosion-resistant tube, it is stated.

The pump is fitted with a safety valve for air line pressure and a hold down clamp to secure the pump into the container, together with 25 feet ⅜" air hose with male or female coupling and chuck attached.

Lead tubes are reported suitable for sulfuric acid, hydrochloric acid, hydrofluoric acid and many others. Saran plastic tubes are recommended where the pump is to be used in nitric, muriatic, citric, phosphoric and acetic acids, bleaches, peroxide and others.

Descriptive literature may be obtained from General Scientific Equipment Co.

• ASA Rayon Standards Sent to 32 Organizations

Proposed American Standards for rayon fabrics were sent last month to 32 national organizations that make up the American Standards Association's sectional committee on rayon fabrics. 51 specifications and 29 test methods are included in the 160-page book. The National Retail Dry Goods Association, sponsor for the ASA project, is asking the national associations and technical societies to give the standards careful study and to vote on whether or not they should be recommended to the American Standards Association for publication as American Standards. If adopted, they will provide means of determining the performance of rayon fabrics for different uses in men's and women's clothing and for home furnishings, it is stated.

Requests reportedly have already been received from leading organizations in the textile field to distribute more than 1,000 copies of the proposed standards so that all branches of the textile industry as well as cleaner, dyer and launderer groups can be informed.

In circulating the document, the American Standards Association has called attention to the fact that the standards place no limitation on weaving or knitting constructions of any fabric, nor on the ingenuity of industry in the use of colors or finishes of rayon fabrics as long as they meet the requirements for serviceability in use. The requirements mostly affect the dyeing and finishing industry and the gray goods, weaving, and knitting industries.

• Production and Sales of Plasticizers Increased

The United States Tariff Commission has released preliminary statistics on United States production and sales of plasticizers in 1949. This report, the tenth of a series giving preliminary statistics on 1949 production and sales of synthetic organic chemicals, gives statistics for plasticizers by major groups, including esters of phthalic anhydride, and of adipic, phosphoric, lauric, oleic, and stearic acids.

Production of all plasticizers in 1949 amounted to 166 million pounds, or 12 percent more than the 148 million pounds reported for 1948. Sales in 1949 were 125 million pounds, valued at 46 million dollars, compared with 117 million pounds, valued at 47 million dollars, in 1948.

The output of cyclic plasticizers in 1949 totaled 122 million pounds, an increase of 12 percent over the 109 million pounds reported for the previous year. Sales in 1949 were 92 million pounds, valued at 34 million dollars, compared with 87 million pounds, valued at 34 million dollars, in 1948. The cyclic plasticizer produced in the greatest amount in 1949 was di-2-ethylhexyl phthalate, production of which amounted to 51 million pounds.

Production of acyclic plasticizers in 1949 amounted to 44 million pounds, an increase of 14 percent over the quantity reported for 1948. Sales in 1949 were 33 million pounds, valued at 12 million dollars, compared with 30 million pounds, valued at 13 million dollars, in the previous year.

These preliminary statistics on production and sales of plasticizers are more than 95 percent complete. The complete statistics will be given in the Commission's final report which will be issued later.

Copies of the section on plasticizers may be obtained by writing to the United States Tariff Commission, Washington 25, D. C.

Dr. Joseph W. Lang

• Dr. Lang Appointed Rensselaer Manager

Dr. Joseph W. Lang has been appointed manager of the Rensselaer dyestuff plant of General Aniline & Film Corporation, according to an announcement by C. T. White, vice president. He succeeds Dr. William L. Walsh, who recently was named assistant to the general manager of the entire dyestuff division of the company.

Dr. Lang joined the Rensselaer plant of the General Aniline Works Division as head of the Chemical Engineering Group in 1943. In March 1948 he was made Supervisor of Production; in October 1948 was appointed Production Manager, and in September 1949 was appointed Assistant Plant Manager at Rensselaer.

• 40 Nations To Exhibit at Trade Fair

Products from more than 40 nations will be exhibited at the First United States International Trade Fair to be held in Chicago August 7 to 20. The Fair, first of its type in the United States, is intended to contribute to better understanding between people of diverse nations. By exhibiting at the Trade Fair, participants are being lauded for encouraging international trade and thereby helping in fulfilling the fair's motto, "World Trade, World Prosperity, World Peace". Special provisions to allow children to see the Fair have been announced by Colonel John N. Gage, managing director of the Fair.

A special rate of fifty cents (50c), including tax, has been established to give children in the Chicago area a chance to see "what and how" more than 40 different countries around the world have been able to produce since the end of the war.

Admission hours for the general public have been set for Tuesday and Thursday evenings, and all day on Saturdays and Sundays, although regular business hours during the day have been set aside for accredited buyers and sellers.

• AOCS Fall Meeting

The American Oil Chemists' Society will hold their Fall meeting at the Sir Francis Drake Hotel, San Francisco, Sept. 26-28. A fourth day, the 29th has been set aside for plant trips. The United States Travel Agency in New York is handling plans for those leaving from the Metropolitan Area.

E. B. Kester of the Western Regional Research Laboratory, Albany, California, is chairman of the meeting. H. S. Olcott of the same laboratory is program chairman.

• C & C Producing Isopropyl Benzoate

Isopropyl benzoate is now being manufactured for the first time in major commercial quantities by Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. Its current price is 22 cents per pound in tank cars, F.O.B. Institute, West Virginia, which is competitive on a contained acid basis with the impure grades of benzoic acid.

Since isopropyl benzoate is a water-white liquid and by ester exchange is a source of benzoic acid, it is of interest as a raw material for alkyd resins. Isopropl benzoate is said to reduce the viscosity during the intermediate stages of the "cook," to dissolve easily, and to react rapidly with available hydroxyl groups of other alcohols and glycols which are raw materials for resins. It is said to be easier to produce high-boiling esters with isopropyl benzoate than with the free acid because it reacts more rapidly and the reaction product is not water but isopropanol, which leaves the system more easily.

The product is a high-boiling (218.5°C.) solvent for many materials including inks and dyes. Its pleasant aromatic odor can be used to build desirable odors in certain industrial products and to mask undesirable ones in others, it is stated.

OBITUARY

LLOYD KITCHEL

LLOYD KITCHEL, a member of the board of directors of Hercules Powder Company, and general manager of the Virginia Cellulose Department, died suddenly June 30 of a cerebral hemorrhage.

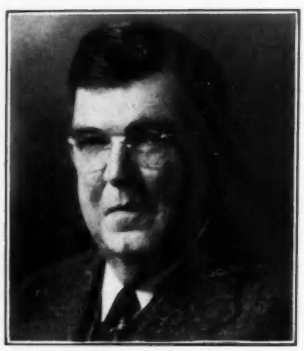
Born in New York City, the Hercules executive had devoted his entire career to the development and expansion of the cellulose industry.

He became associated with the Virginia Cellulose Company in Hopewell in 1926 to serve as vice president. The company at that time was a subsidiary of Hercules Powder Company. When the Virginia Cellulose Company became the Virginia Cellulose Department of Hercules in 1929, Mr. Kitchel was named sales manager of that department. He became general manager of the department, and a director of the company, in 1937.

Mr. Kitchel's duties as general manager included the supervision of Hercules relationship with Holden Vale Manufacturing Company, Ltd., in Haslington, England, a Hercules affiliate which produces chemical cotton.

CHARLES I. DAY

CHARLES I. DAY, president of W. & L. E. Gurley, Troy, N. Y., died June 22 after a long illness. Mr. Day had been associated with Gurley since 1919, serving as general manager and later as president and director of the company.



Charles I. Day

GEORGE W. PRESSELL

GEORGE W. PRESSELL, 62, vice-president of E. F. Houghton & Co., Philadelphia, died suddenly on June 5 at his summer home in Ocean City, N. J.

Mr. Pressell was the oldest Houghton employee in point of service, having started as a messenger boy 47 years ago. He had held offices of Chief Chemist, Secretary, 2nd Vice-President, General Sales Manager and Director of Sales. Since 1919 he had been a member of the Board of Directors. He was also President of E. F. Houghton & Co. of Canada, Limited.

He developed the first treated quenching oil, and held a patent on a sulfurized cutting base, the first concentrate perfected for dilution in the user's plant. He was one of the founders and first chairman of the Phila. Chapter of the American Society for Metals.

Abstracts—

(Concluded from Page 488)

The author gives details of the polarographic method, which makes use of the fact that at a dropping mercury electrode processes of electro-oxidation or electroreduction occur at potentials which are characteristic of the oxidizable or reducible ion. He compares this method with the chemical methods most commonly used (Indigo carmine, iodine, etc.) and shows that the polarographic method has a degree of specificity superior to that of the chemical methods in several noteworthy instances.—W.H.C.

Some Observations on the Tendering of Nylon by Exposure to Light

O. Newsome, *J. Soc. Dyers & Col.* **66**, 277-80, May, 1950.

The primary purpose of the present work was the purely practical and somewhat restricted one of comparing dyes of various types which are used for the production of blacks on nylon, in their effects on the tendering which occurs on exposure to light. For this purpose, loss in mechanical breaking strength was considered a satisfactory measure of the degree of degradation.

Preliminary experiments indicated that logwood increased the resistance of nylon to light considerably, and the work was extended to determine whether this was due to some specific property of the dye or impurities in the dye, or whether a similar degree of resistance resulted from the presence of chromium compounds only.

Dyeings were made on nylon yarn with four black dyes diazotized and developed with betaoxynaphthoic acid; with hematine crystals, both after-chromed and on a chrome mordant; with an acid black, and with an after-chromed black. They were exposed to sunlight, with undyed yarn, for six to eight weeks (or until British Standard No. 5 was strongly faded.) They were then tested for tensile strength.

The loss of strength was greatest with the undyed yarn (average of 61%). Most of the developed dyes were only slightly better; the acid black a little better still; but the after-chromed black and the hematine dyeings were much stronger (only 20-25% loss).

Tests made on the same yarn (undyed) with dichromate and acetic acid, and similarly exposed, also showed a definite improvement in tensile strength. The conclusion is that the protective action of logwood on nylon is mainly due to the presence of chromium.—W.H.C.

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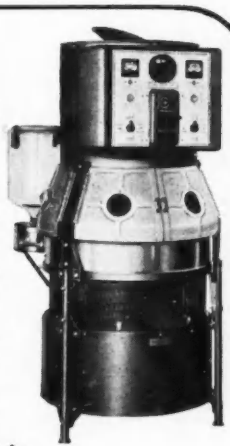

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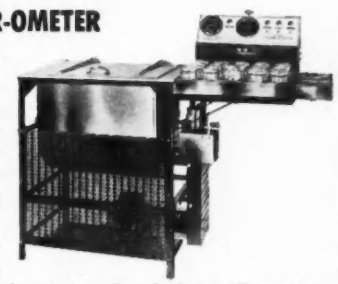

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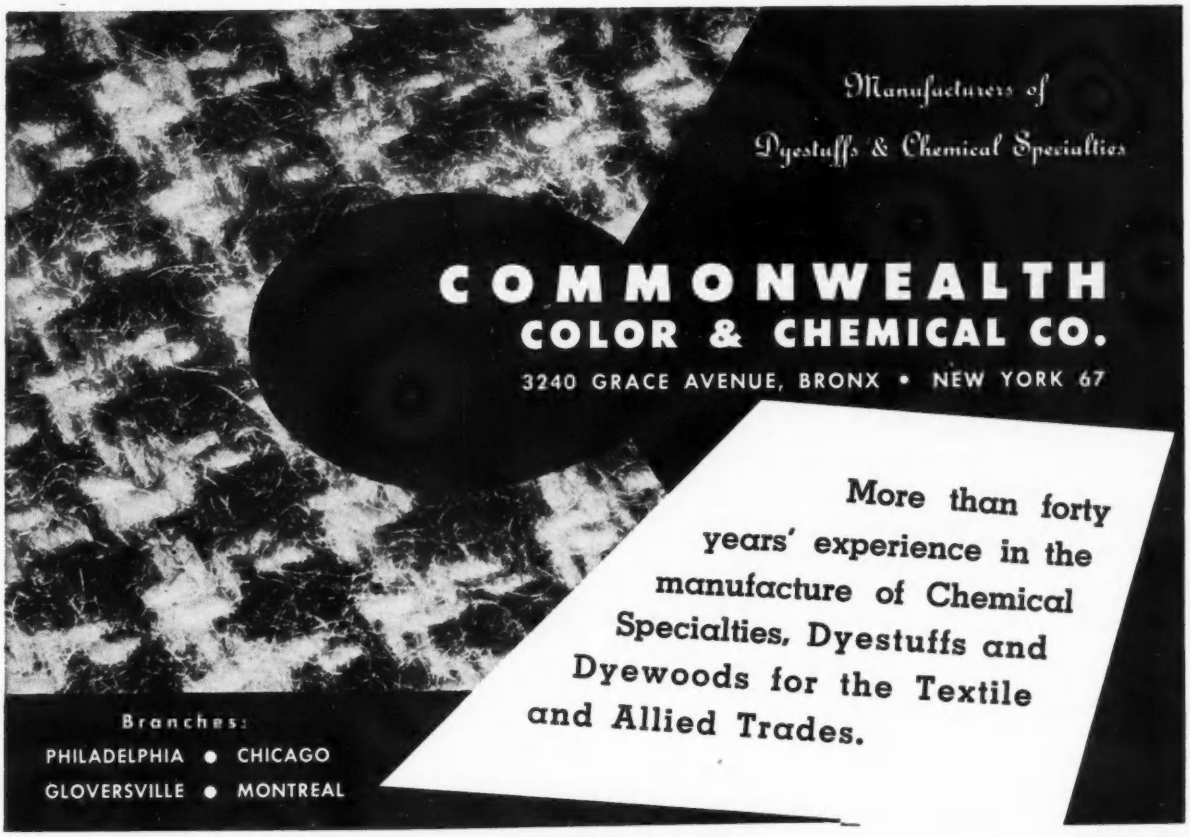

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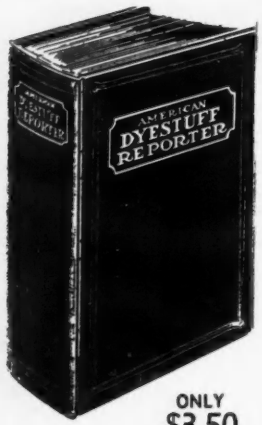

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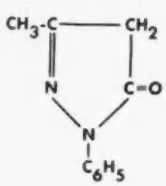

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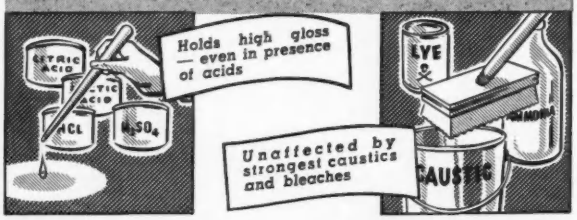

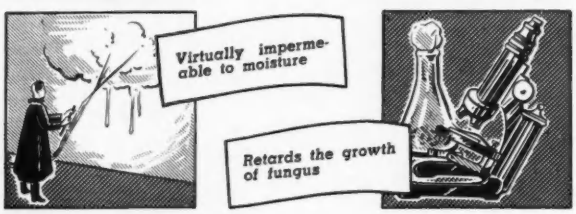

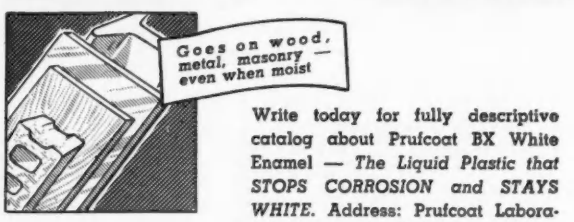

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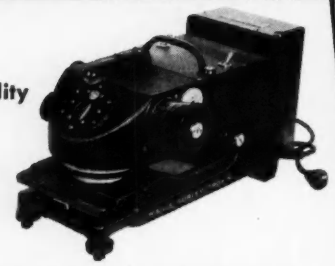

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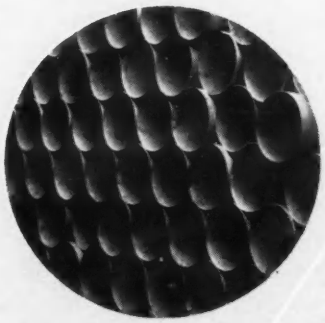

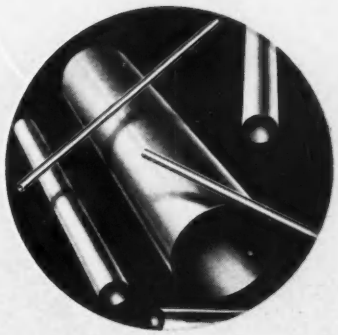

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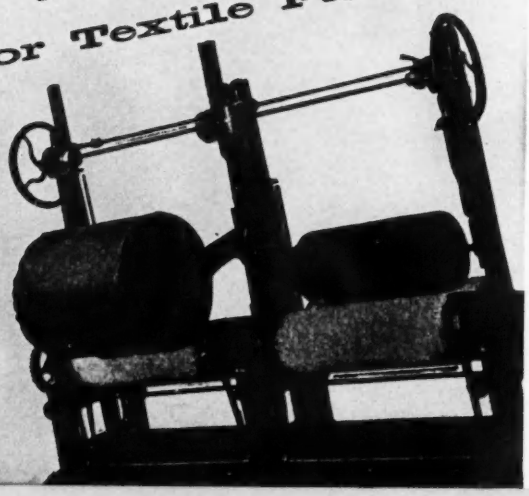

Saturday Evening Post
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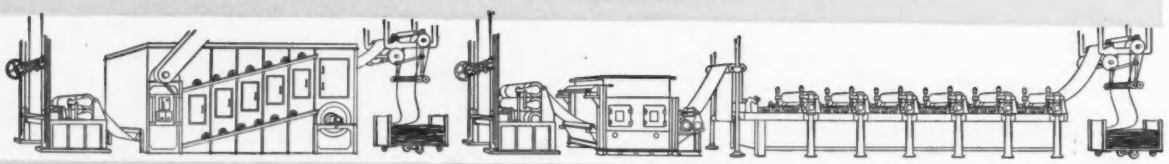

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